The Glass Industry
REG. U. S. PAT. OFF.

Vol. 9 JULY, 1928 No. 7

Aspects of Bottle Machine Operations

By B. M. Pearson

SINCE bottle making machinery has now come into universal use, a study of the operating conditions, with a view to the securing of the best working results should, of course, be a feature in any plant of size.

Machines can be semi-automatic or semi-automatic operated in a fully automatic manner by the incorporation of a feeding device and a blank transfer mechanism. Finally we have the fully automatic machine, as exemplified by the suction machine, in which class, the Owens machine, for years, held the field alone, but has now rivals in the similarly constructed English Redfern machine, and the smaller Continental and English 1, 2, 3 or 4 mold suction machines, such as the Wilzin, the Severin, the McNish, etc.

Semi-automatic narrow neck machines are being fast replaced by the fully automatic machines, principally of the flow type. These machines closely follow the fully automatic flow machine in principle. They are of the turnover parison type. The glass is gathered on the end of a punty, and dropped into the upturned parison mold. The parison is then blown up, and the blank mold is opened and the blank is swung over by its ring mold, into the open blow mold, which is then closed on the parison, and the bottle is blown up. Being conducted with the aid of a fair concentration of labor, comparable to a hand bottle making unit, the results obtained are dependent, to some extent, upon the personal element. Thus, the degree of puff admitted to blow up the parison, the way in which the air is admitted, the length of time in which the blow is held, are all operations controlled entirely by the operator, usually a youth, and are operations upon which the quality of the finished bottle is dependent. There is an interesting psychological study involved, and the problem is not a little perplexing. Thus if the workers are paid on a time basis they will slack, invariably as much as possible, and the production will accordingly fall off. If they are paid on a production basis, they will tend to slack off, as far as quality is concerned, and to produce the greatest number of bottles. The only really satisfactory way is to pay the operators on production, and pay on results. Thus the bottles will be sorted into firsts and seconds, the top price being paid for the first quality, and a lower price for the second quality. The crew on the machine must be trained to work well together, as otherwise production will fall off seriously. One of the chief troubles in operating semi-automatic machines is to secure a good distribution. This arises from several causes. One is the personal element, as mentioned above, in the matter of introducing the blow air and securing the satisfactory blowing up of the bottle. It will be found that semi-automatic operatives are very versatile in this respect. They manipulate the compressed air valves with great cunning, and an extraordinary complexity of turning on and off. This is stated to imitate the hand blowing process as much as possible. The average hand-blown bottle is noted for its excellence of distribution. Another trouble is that owing to the slow speed, it is difficult to keep the molds satisfactorily warm, and bad distribution may accordingly arise from this case. The drawback of semi-automatic machines is the large amount of labor required to operate the machine, and the slow speed of working. For this reason they are mainly relegated to working on small orders, and specials, which are not of a sufficient size to warrant them being run on a large automatic machine, and which would otherwise have to be made by hand.

Flow Machines

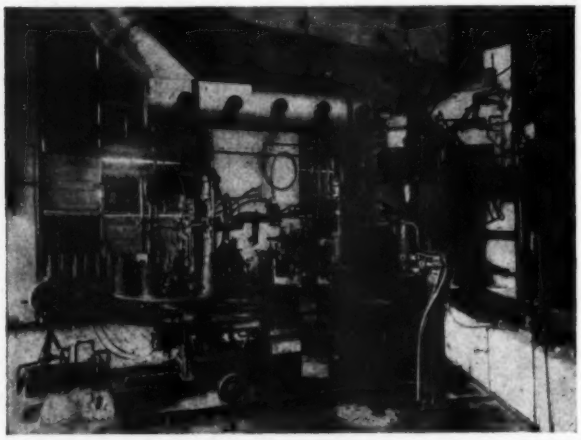
The second class of machine to consider, or, as it is called, the feeder-fed or flow machine is very similar to the semi-automatic. The flow machine is simply a semi-automatic machine, with the glass fed by a feeder instead of a gatherer, and with the various forcing operations linked up, and performed mechanically. The construction of the machine is correspondingly strengthened, so as to enable the units to withstand the mechanical stresses imposed. The necessity for this strengthening of the constructional details was not sufficiently realized in the early days of flow machine design, and the machines were made very little stronger than the semi-automatic machines from which they were evolved. Consequently the wear and tear was very rapid, and the machines migrated with more or less celerity to the scrap heap. This has been remedied, and the march of progress

has eliminated the "tinny" flow machine, and replaced it by a much more substantial mechanism altogether.

Flow machines must, of course, be considered from three distinct aspects—the press machine, the press and blow machine, and the narrow-neck bottle machine.

Press and Blow Machines

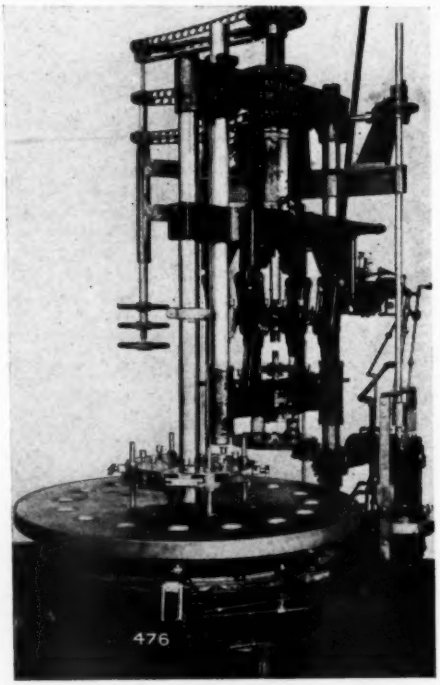
The press and the press and blow machines represented the earliest evolution of the flow machine, and they were turning out wide-mouth ware at a time when narrow-neck



O'NEILL STANDARD NO. 28, AND O'NEILL FEEDER
Installed in England

bottles were still being made by hand. The press and blow machine is simply a development of the press machine. The press machine is capable of making all ware with a smooth regularly shaped interior, and tapering somewhat toward the bottom, and without a finish. Examples of such ware are tumblers, fruit dishes, containers for preserves, etc. A water-cooled plunger is pressed down on to the glass, and forces it to take the shape of the mold. The plunger is preferably actuated by a toggle mechanism, and its motion so controlled by a suitable arrangement of powerful springs that it pauses, at the point of maximum pressure, in the mold. This pause may last for a few seconds, and serves to allow the glass time to accommodate itself to the mold. This pause is very necessary in the case of the pressing of ware with a more or less complicated exterior, such as the imitation cut glass, and also, in the case of ware with a plain exterior, such as tumblers, etc., serves to assist in giving a good distribution. The shape of the plunger in the case of a simple press machine must be regulated by the inside shape desired for the ware being produced. The pressure of the plunger is very important. Too low a pressure will give a badly shaped article, while too high a pressure will give trouble such as surface defects, crizzles. The correct plunger pressure to employ will vary with the shape of the article, and the weight, also the nature of the glass and with other similar considerations. It was stated above that a water-cooled plunger is employed; this is necessary to prevent the plunger becoming too hot, and letting the glass stick to it. Care is necessary, with the water used for this purpose. It must be as "soft" as possible, i.e., contain very little dissolved impurities, and be quite free from impurities in suspension. If a hard water is employed, or one containing material in suspension, a heat insulating lining will be deposited on the inside of the plunger, and cooling will be impossible, with resulting trouble. The cooling of the plunger is more important still in the case of press and blow machines, which generally work at a higher speed than simple press machines. It is necessary to employ springs on the plunger head, so as to obviate "over-pressing." The charge of glass is not entirely uniform, so that unless definite means are adopted to afford a pressure relief, when, for instance, more glass than usual is in the mold, it is very probable that something will be broken. The incorporation of strong springs on the plunger head provides this mechanical safety valve, also allow for the plunger being gently brought to rest when it has reached its lowest point of travel, instead of stopping with a jar, and in addition, affords a ready means of providing for a pause in the plunger travel, at the position of maximum pressure.

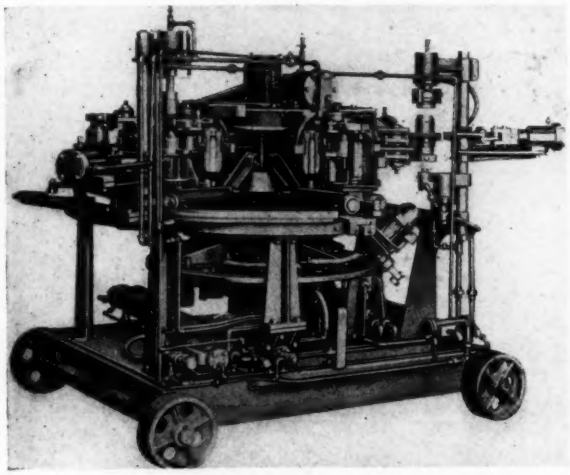
As has been stated above, the press and blow machine is a development of the press machine. In the press and blow machine two mold tables are provided. On the first table are mounted the press molds, and on the second table the blow molds. The press molds are operated with a



WM. J. MILLER MODEL AGA
Motor Driven, High Power Toggle Press

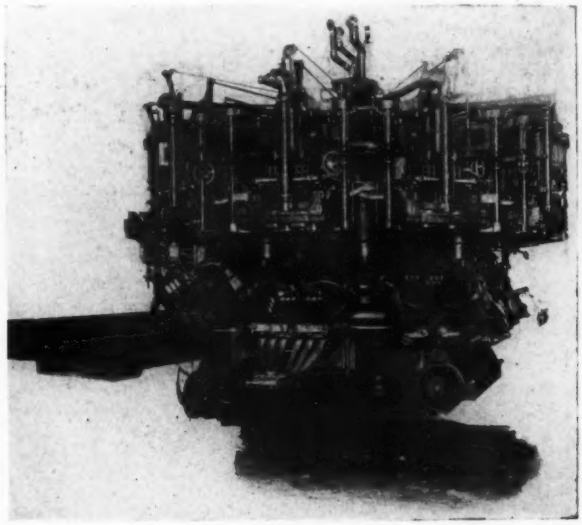
plunger in the usual way. No special shape is, however, given to the blank pressed, that is the shape of this blank has little or no reference to the shape of the finished article. This is possible because the required shape can be imparted in the subsequent blowing operation. The pressing serves to form the finish. In general the parison is given a conical shape. As there is a considerable latitude as regards the shape which can be imparted to the parison, it is possible to vary the shape of the plunger on a press and blow

machine. The variation will be found to be of great benefit, as when the correct shape is found, the machine speed possible will be found to be influenced very profoundly, as also will the quality of the ware. The speed of operation will be decided within limits by the shape of the plunger, as stated above, and also by the temperature of the glass among other things. Too high a temperature will enable the glass to flow very rapidly and conform to the shape of the parison molds very easily, but will slow up the machine,



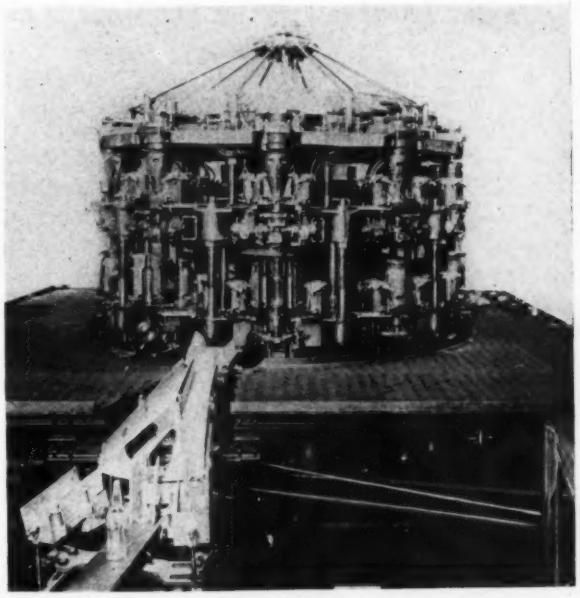
MODEL B-1. MILLER MACHINE AND MOLD WORKS

owing to the appreciably greater time required before the plunger can be withdrawn, without risk of the collapse of the parison in the blank mold, and before the parison has set rigid enough to be handled and transferred to the blow mold. Too high a temperature will tend to give blisters in the ware, a rough surface, and perhaps crizzles. Too low a temperature of the glass will give a very bad distribution, owing to the sluggish flow of the glass, and will form crizzles. Owing to the too high viscosity of the glass, the plunger must also rest in the mold for a lengthy period, to ensure really satisfactory ware. Defects in such ware, for example, as jam jars or fruit jars, i.e., ware which has a finish, will be not filled up in ring; split-rings. Regarding split-rings, also, unsuitable design or unsuitable operation of the plunger will be a prolific cause of split-rings. The remarks appertaining to the pressing of the parison can also be applied to press machines. After the parison has been pressed, it is transferred to the blow table. It is deposited in the appropriate blow mold, and a blow head is then placed on top of the finish, and the parison is blown up to conform to the finishing mold. Defects occurring during this procedure may chiefly arise from the chilling of the surface of the parison, which takes place during the transfer, and from the unsuitable application of the compressed air. If the surface of the parison is chilled during the transfer, the surface will be badly torn during the blowing up. Also the bottle will not take the shape of the mold very well and the distribution is certain to be bad. If the compressed air is not applied in a suitable manner, defects in the body of the bottle, below the mold parting line will be caused. Water in the air line will result in uneven or feeble air pressure, giving defects such as not blown up, thin bottoms, uneven bottoms, bad distribution, thick shoulders, etc. If the glass is being delivered to the machine too hot, and the parison is being handled too quickly, it will most likely sag in the press-mold. When transferred, the finish will probably lie unevenly in the blow mold, and if the blowhead cannot from this cause, rest evenly on the



OWENS AUTOMATIC BOTTLE MACHINE
Plural 10-Arm, Latest Type

parison, leakage of pressure will result, giving the defects referred to immediately above. If the parison is transferred, while too hot, thin shoulders and thick bottoms will



OWENS FLOW DEVICE—AY MACHINE—10 ARM

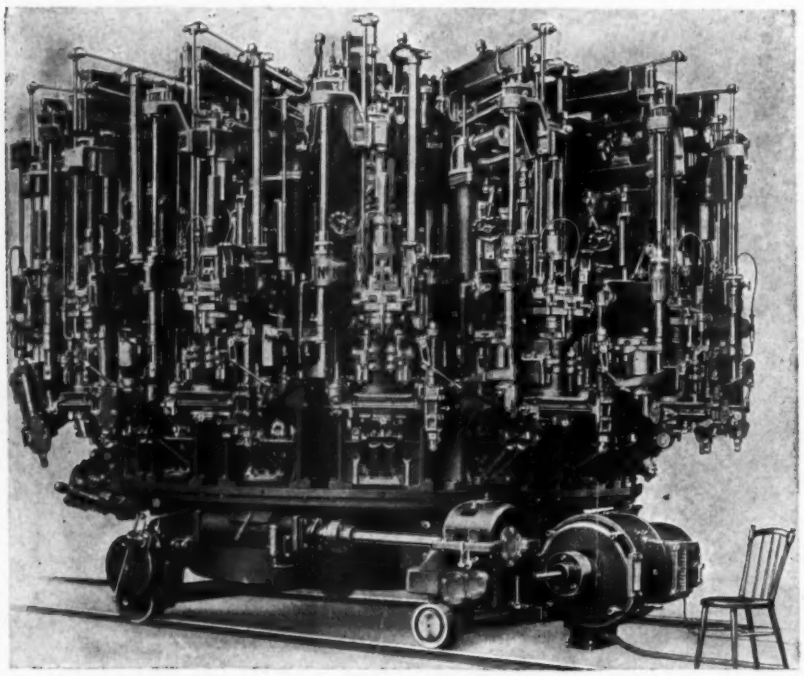
result in the finished bottle. The chilling of the parison, referred to above, occurs during the transfer from the press table to the blow table. Modern examples of press and

blow machines cut down this chilling effect as much as possible, by placing the molds as close together on one table as possible. This is effected by alternating the two sets of molds. Examples of such machines are the W. J. Miller, P. C. E., P. C. D., and similar types. More attention could be paid to the cooling of the blank or press molds, on the press and blow machine. Thus, on the Daubenspeck machine, operating in England, there are 16 blank molds, with corresponding benefit to the operation. The writer has had considerable experience of press and blow bottle machines, including Daubenspeck, early Miller machines and the latest type of machine as exemplified by the Miller P. C. D. machine, and has yet to find a machine which will give a better quality line of wide mouth ware than this class will produce. The quality can be maintained at a higher pitch than on the Owens machine, even, with suitable operation, of course.

There is a limit to the amount of lime which can be used in press and in press and blow machines. Too high a lime content will result in a great amount of crizzles, and a large number of split rings. The best working figure will generally be round about 7.5 to 8 per cent of lime in the glass.

It will no doubt have been obvious that the press and blow machine is not capable of making a narrow necked bottle. These are now, by the flow process, invariably made on the turnover parison type of machine, either single table or double table. The gob or gather is dropped into the upturned parison mold, which is closed at the bottom by the tip or plunger. The glass is packed round the tip, and is then blown up by the puff. The parison mold is then turned over so that it is right way up, and opened. The parison is then taken by its ring mold over to the second table, into an open, waiting finishing mold, which then closes on the parison, and the bottle is subsequently blown up by one or more blow-heads. The chief troubles arising with this class of machine are bad packing round the tip, giving thick and uneven necks, and choked and narrow bores, bad distribution, split rings, crizzles due to chilling during the transfer, uneven bottoms, not blown up, ring not filled up, thin seams, and blistered rings. This type of machine has been successfully adapted for producing internal screws for beer bottles, etc., by imparting a rotatory movement to the tip, and in this case, the troubles with the rings, mentioned above, are accelerated. Chilling of the transfer is obviated by mounting all the molds on one table.

It will be obvious that to effect the various operations on these flow machines such as receiving the gob or gather, pressing, transferring from one table to another, etc., a pause must be made in the revolution, while the operation is proceeding. The machines are now made strong enough to withstand the mechanical strains imposed by this constant stopping and starting. Consequently, designers have turned their attention to obviating the necessity for such continual arresting of motion, and by mounting all the molds on one table, one set above the other set as in Owens practice, arrange for the machine to receive its gob and to make the transfer on the move, and so are able to arrange for the continuous rotation of the machine. In the case of the press and press and blow machine, the motion must be arrested during the pressing operation. For such machines, therefore, designers have evolved very ingenious systems, designed to ameliorate to a very considerable extent, the shocks arising from the stopping and starting. An example is the Geneva movement incorporated in a line of modern press and press and blow machines. By means of a continually rotating spider, driven by an electric motor, the machine is gently brought to rest, and gradually started up again.



THE NEW REDFERN 15-ARM SUCTION BOTTLE-MAKING MACHINE

The sizes recommended are 6, 10, 12, or 15 units. Each of these sizes can be converted into any other of these recommended sizes in 2 days. A 15 unit machine can be erected in 2 days and completely dismantled in 8 hours. The units are interchangeable. A single unit can be replaced ready for work in 25 minutes.

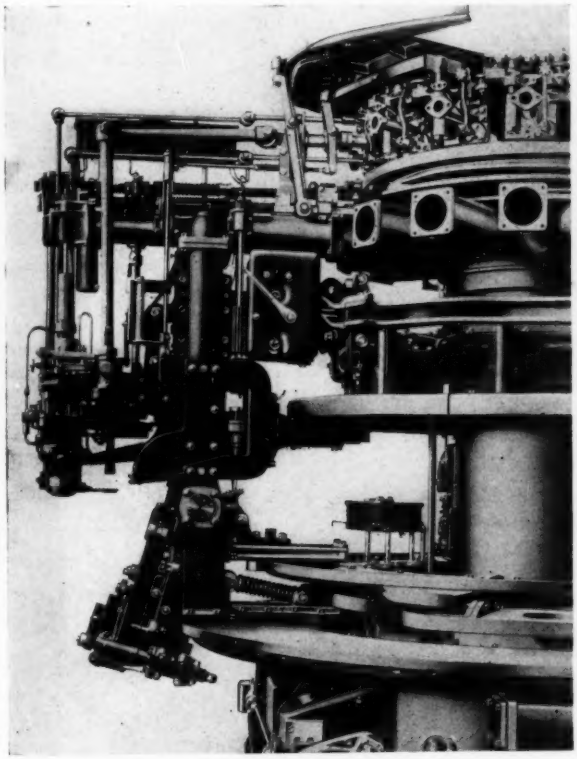
Ten different bottles varying in size, shape weight and capacity can be made at the same time on the 10, 12 and 15 unit machines and six different bottles on the 6 unit machine

Operating speed 1½ to 6 revolutions, per minute.

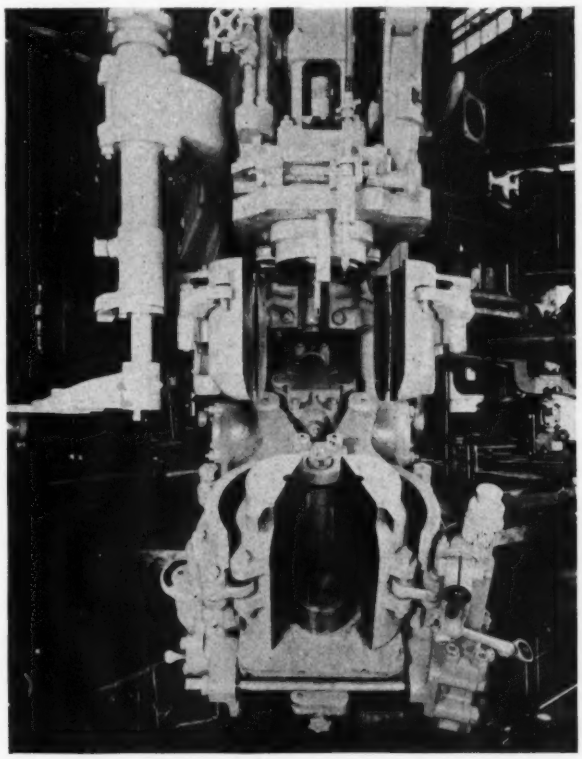
Other designs of intermittent flow machines use a compressed air cylinder and a rack and pinion or a similar device, to move the machine a station.

Suction Machines

The suction type of machine, in the case of the fully automatic Owens and Redfern type is arranged for continuous rotation. The principle is well known. The glass is contained in a revolving basin, held at a suitable temperature, and the parison molds in turn, are pressed down on to the surface of this glass. A vacuum is applied to the blank mold then, and it fills itself with glass. The blank is formed, and subsequently transferred to the finishing mold. There are defects which are peculiar to the process and to the machine, and also a number which are common to other machines. The use of the vacuum will at times cause difficulties. Leaky blanks, for instance, will permit the vacuum to escape, and will result in insufficient glass being sucked into the parison mold, giving rise to thin bottoms and walls and over-capacity bottles. For the best results, the vacuum should be as high as possible, so as to get the glass into the mold as quickly as possible. The vacuum is stated by some authorities to be a prolific cause of blistered rings. Practically all the air is drawn out of the blank mold, and when the glass is drawn up it will make very close contact with the side of the mold. On cooling, the glass in the ring mold will contract and draw away from the side, leaving a space which will contain a vacuum, and will allow the dissolved gases in the glass to come out of solution, and to form bubbles or blisters in the ring. Blisters generally are rather an obscure phenomenon, and it appears probable that there are several separate contributory causes. Carbon in the glass in the pot from oil off the machine, or from the gas or oil is known to cause blisters. If a low vacuum is used, resulting in a relatively slow filling of the parison mold, and the consequent long continued exposure of the glass to the vacuum, blisters will conceivably be formed. Blisters may also be formed in the pot by gas coming out of solution from the glass, by the agitation of the parison mold; by the lapping over of the cut-off, enclosing air-bubbles. Remedies for blisters are to work the revolving pot at a higher temperature, with the inevitable slowing down of the machine speed, and to alter the pot speed relative to the speed of the machine, giving time for any lapped cut-offs to be melted in before being again worked.



ONE OF THE REDFERN UNITS—DIPPING POSITION



MOLD SYSTEM AND KNIFE—REDFERN MACHINE

Common Defects

The cut-off will give trouble. The principle trouble is a dirty cut-off, resulting from bad condition of the blank noses, and a defective knife. The glass is not cut-off cleanly, and then flaky pieces remain on the bottom of the parison molds, and on the knife, and are incorporated in the next cut-off, fusing in on the bottom. The knife may be blunt, may be of the wrong angle, may be loose, and may not be cutting closely to the blank bottom. Air blisters occur with a lightly dipping parison mold, and are large air bubbles or inclusions, drawn up with the rest of the glass. An eccentric pot in the horizontal plane may also give this trouble. Blank seams are where the blank has too big a clearance. The remedy is to make an adjustment,

Typical Working Compositions Used on Various Types of Bottle Making Machines

	(1) O. M.	(2) O. M.	(3) O. M.	(4) O. M.	(5) Flow	(6) Flow	(7) Flow	(8) Flow	(9) Flow	(10) Flow
SiO_2	75.00	74.54	73.32	67.65	73.34	73.09	74.13	73.88	74.01	72.0
Al_2O_3	0.53	0.35	0.56	2.92	0.70	1.23	0.37	0.62	1.08	2.1
Fe_2O_3	0.048	0.06	0.25	2.30	0.054	0.36	0.06	0.06	0.17	0.15
CaO	5.10	10.70	7.80	11.32	8.49	8.61	7.90	7.65	7.21	8.5
MgO	3.32	0.05	0.77	0.12	0.13	0.06	0.11	0.16	0.06	0.2
Na_2O	16.00	14.30	16.75	13.55	17.29	16.34	17.43	17.63	17.47	17.0
MnO	....	....	0.55	2.14	....	0 31	....	....	....	....

(1) Owens Flint. (2) Owens Flint. (3) Owens Amber. (4) Owens Green. (5) O'Neill Flint. (6) O'Neill Amber. (7) Daubenspeck Pr. and Blow Flint. (8) Miller Press Flint. (9) Miller Pr. and Blow Pale Green. (10) Graham Flow. Pale Green.

or to change the blank. Hot blanks will give sticking, and thin shoulders and thick bottoms. Thin shoulders will occur both with cold glass and with hot glass. With cold glass, the metal will chill, and will not rise up the mold readily. With hot glass, in applying the puff, the glass may all be blown away from the shoulder. Thin seams are caused by hot glass. Cold glass will give very uneven distribution, and will cause the metal to blow up in lumps, and generally gives rise to thin bottoms. Tear under ring occurs with ware having an external screw on the finish, and may be remedied by adjusting and easing the mold, or by replacing the ring mold. Crooked necks are occasioned by bad registering of the finishing mold, with the ring mold. Mold marks show the marks of the mold tool on the bottle, and are disfiguring. In bad cases, the mold must be re-turned. Split rings are due to a cold tip, or a tip of too straight or too curved an outline, also to cold ring molds, and vibration of the mold carrier. Dannied or shouldered ware is generally ascribable to too sharp a curve on the shoulder of the mold. Tight bores are due to cold tips, to cold glass, to worn tips, and to inaccurate machining. High and thick seams are due to bad mold machining, and to bad registration on the machine, and will naturally invariably occur if the molds are neglected and are not kept in good condition.

It is amazing what a personality a glass bottle machine possesses, and while these notes will indicate the chief faults, and their eradication, and will serve as an outline for the manner in which glass bottle machines should be conducted, a considerable amount of detail of the actual manipulation of the glass to the machine and the operation of the machine can only come from experience of the local conditions.

With all bottle machines, the glass composition must be kept as constant as possible. The Owens machine may work with a wide range of compositions. In the following table is given the typical working compositions used on the various types of machines. It will be apparent that a fairly considerable diversity occurs in the composition used on any particular machine. However, within limits this is not so important as keeping the working composition, once it has been standardized, as constant as possible.

Designing Glass Forming Molds

For the Purpose of Obtaining Temperature Control

By Roy E. Swain[1]

THE mechanical construction of a mold sometimes gives cause for considerable thought and calculation, but with compass and dividers the draughtsman can determine to a fair degree of accuracy whether or not the mold will release the article. However he has no instruments or tables to guide him in balancing the mold from the standpoint of temperature distribution. Experience and good judgment alone can direct him in his efforts and most of the new molds are sent back to the shop for slight changes and alterations that will add to the quality of the ware or the workability of the mold.

Some factories making popular priced goods do not stress the quality of their wares but build their molds for quantity production so we find a great deal of poor glassware on the market that could have been very good had a little more time been spent in designing and building the molds. We also find a great deal of popular priced ware that in finish and workmanship excels some of the so called "better class" ware. This glass has been made in quantities and the molds studied so carefully that perfectly balanced molds have been developed.

A mold may be perfectly balanced for working conditions in one factory yet give a great deal of trouble in another factory having a different system of working or another kind of auxiliary equipment. Or a mold worked out for one kind of glass may not be workable in another glass having different working characteristics.

Paste molds are simple in construction and being water cooled do not often cause trouble because of temperature distribution. Paste molds were first immersed in water, but later sprinkling systems were used, the general belief being that the carbon coated surface of the mold became saturated with water which in turn was vaporized by the hot glass, this steam forming a cushion that prevented the glass from coming into contact with the surface of the mold and in this way preserving the natural gloss or fire finish of the glass. Sometimes it is desirable to work the molds at a

[1] Engineering Dept., Macbeth-Evans Glass Company, Charleroi, Pa.

speed at which it would be impossible to either immerse or sprinkle. For such cases the water jacketed mold was developed such as shown in Fig. 1. The operation of this mold detracts something from the cushion of steam explanation of the working of paste molds.

The iron blow molds are more complicated and present some difficult problems in temperature balance as the molds to produce presentable ware must be hot enough to prevent

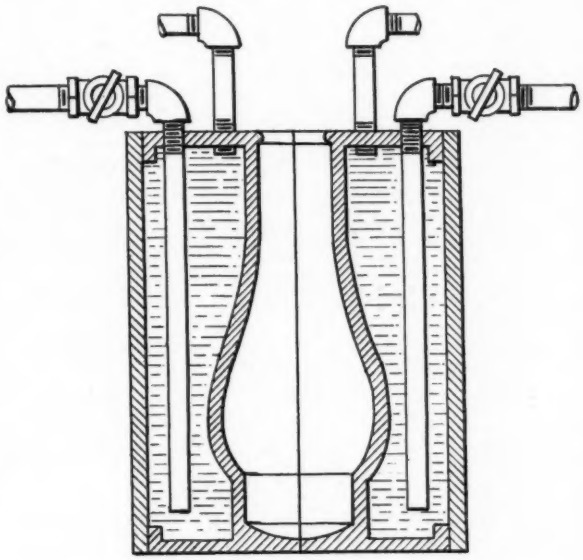


FIG. 1

checking or chilling the glass and yet not hot enough to adhere to the glass or throw scale.

Several substitutes for cast iron have been introduced in the last few years. Also surfacing the cast iron with a denser metal to impart a better finish to the glass and obtain a longer life for the mold has been introduced. These new materials may modify the design of molds to some extent yet the principles governing the design of cast iron molds will no doubt apply to these as well.

As a rule it is desirable to secure practically a uniform distribution of glass throughout an article but this is hard to obtain in practice. However this variation will be fairly constant and can be foreseen by one familiar with glass working methods. This enables the designer to place the metal in the mold so that the heavier part of the glass blank comes in contact with the heavier part of the mold. One also has the temperature gradient of the blank to consider in balancing a mold. Few mold designers try to secure perfectly balanced molds, preferring to compromise the working qualities of the molds to lighten the task of casting the molds.

The molds radiate heat to the surrounding atmosphere but all parts do not have equal ventilation. The bottom plates of iron blow molds are often made too light as upon them falls the task of removing the heat from not only the heavier but the hotter part of the blanks. This coupled with the lack of ventilation causes many bottom plates to fail before the bodies of the molds.

To give molds a greater radiating surface they are sometimes provided with fins. Fig. 2 shows sections through molds provided with cooling fins. A represents a horizontal section through a press mold having vertical fins. B represents a vertical section through an iron blow mold having horizontal fins.

Machine molds are more delicate than hand molds. This is duc mostly to the difference in the preparation of the blanks and the difficulty experienced in adjusting the cycle of the machine operation. The temperature distribution of a machine prepared blank differs so greatly from that of a hand prepared blank that we find a great difference in the distribution of metal in hand and machine molds for the manufacture of the same article. Machine molds are made much lighter than hand molds to enable them to keep hot. The hinges, clamping lugs and closing devices add so much to the weight of molds that these parts "run cold." Many of the automatic machines use molds and blanks that are fitted into hangers, housing or cages. In these molds the forming parts are simply inserts and possess many advantages not within the scope of this article. This type of mold enables the mold maker to balance the molds to a nicety not possible with solid type molds. When a mold works cold in

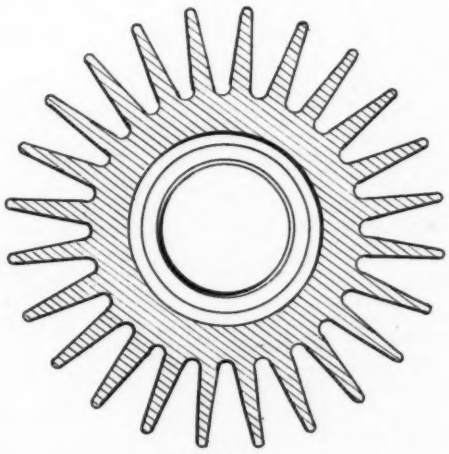


FIG. 2-A

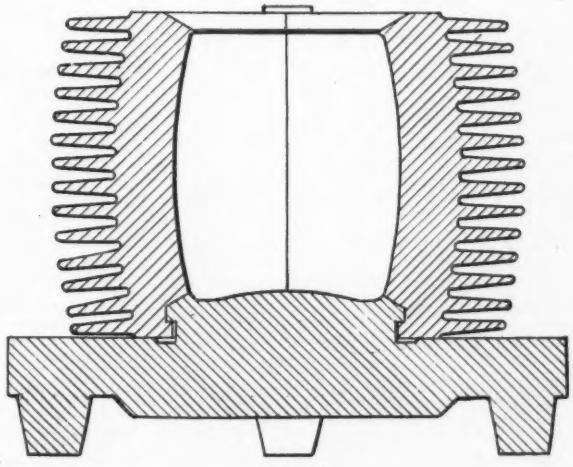


FIG. 2-B

a certain section it is comparatively easy to put the mold in a lathe and lighten this particular section.

The most baffling and difficult molds to work out are the press molds, for the shape of the article often makes it impossible to distribute the metal properly and retain the mechanical strength necessary to withstand the pressure used

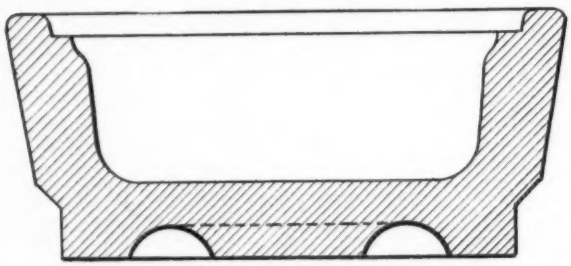


FIG. 3

in forming the ware. A great many ways have been devised for retaining the heat in certain parts of the mold. A few well known examples will be given that show the principles involved. Once the principles are understood they may be applied to similar problems with but little thought.

The bottoms of many press molds are difficult to heat be-

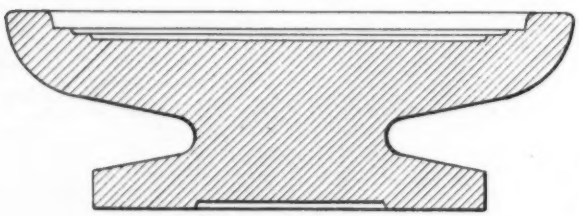


FIG. 4

cause of metal necessary to make the foot of the mold and the loss of heat by conduction into the press table. Such molds are usually hollowed out to provide a dead air space that acts as heat insulation. This dead air space is shown in Fig. 3. The pedestal type mold reduces the amount of heat transferred into the press plate by undercutting the mold as shown in Fig. 4.

Press ware is subject to chill wrinkles when the glass or mold is cold. These wrinkles outline the gathering as it lays on the mold at the time the plunger comes in contact with the glass. These may be greatly reduced or eliminated by making the molds relatively light in the section showing the chill wrinkles. This is shown in Fig. 3.

The central section of the mold is in contact with the glass longer, and the laying rather than pressing the glass onto the mold here makes it necessary to keep this part of the mold at a higher temperature in order to give the glass a good finish. This causes this section of the mold to fail before the remainder of the mold. When the design of the ware permits, the molds are often provided with replaceable bottoms as shown in Fig. 5. By being inclosed these replaceable bottoms will retain the heat better but may also be undercut to lessen the probability of chill wrinkles. In case the chill comes near the edge of the bottom the insert may be undercut as shown on the right. If nearer the center the insert may be cut away as shown on the left.

Any break in the metal is an insulation, for no matter how well the joint is machined the heat transfer by conduction is greatly reduced. An example of this is shown in Fig. 7 in which the wearing part of the ring is inserted. In Fig. 7 is also shown a method of cooling the tip of a plunger and

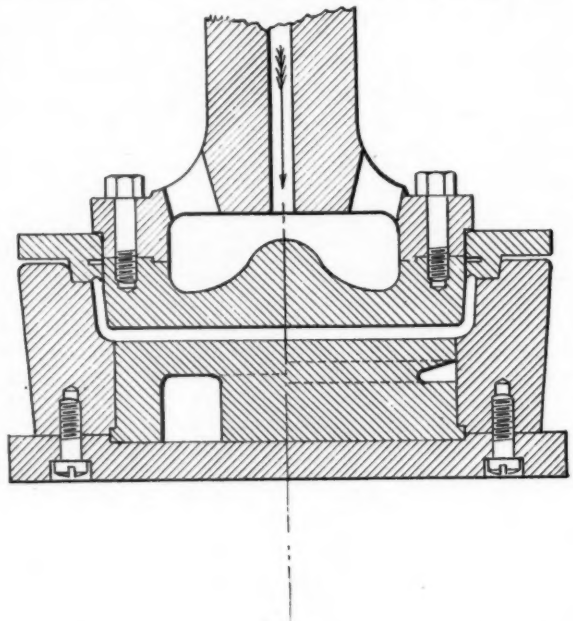


FIG. 5

protecting the shoulder from cooling. In a certain class of small jars the plunger tips are run very cold to insure the easy release of the plunger.

In hand pressing it is sometimes advisable to work but

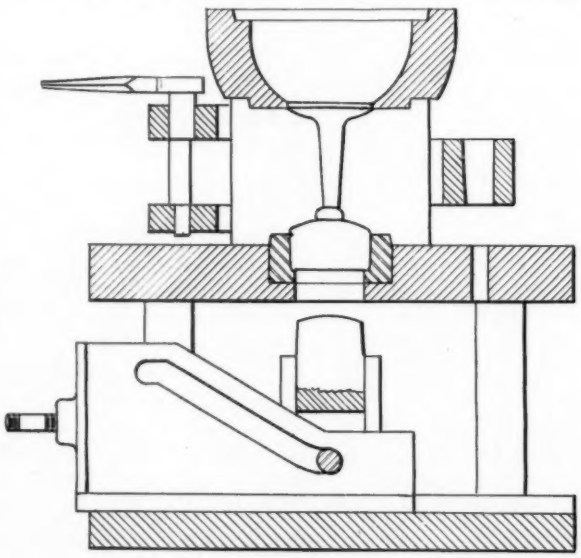


FIG. 6

one or two molds. The ring forming but a small part of the article is unable to absorb enough heat from the glass to keep it in working condition. Such rings are cut away as far as possible to reduce the weight and heat insulating

grooves provided as shown in Fig. 5. When these fail additional heat is supplied from burners. When a cutting groove in a mold might weaken it or if this is difficult to accomplish, it is sometimes possible to drill out around the section running cold. Fig. 8 illustrates an extreme case.

There are many cases where it is impossible to provide enough metal to absorb the heat. In the case of plungers inside air or water cooling equipment has found many uses. The plunger in Fig. 5 is a well known type of air cooled plunger.

In some cases the part of the mold that overheats can be made up in sets and worked in rotation. A number of shells are worked with a single bottom plate in making covers with knobs or a number of bottom plugs are worked with a single mug mold.

The use of wind on the molds or plungers is usually left to skill and judgment of the workman. However in some cases it is necessary that the designer of the mold make provisions for the use of cooling wind. The cup foot or "shovey up" valve type of mold shown in Fig. 6 is a good

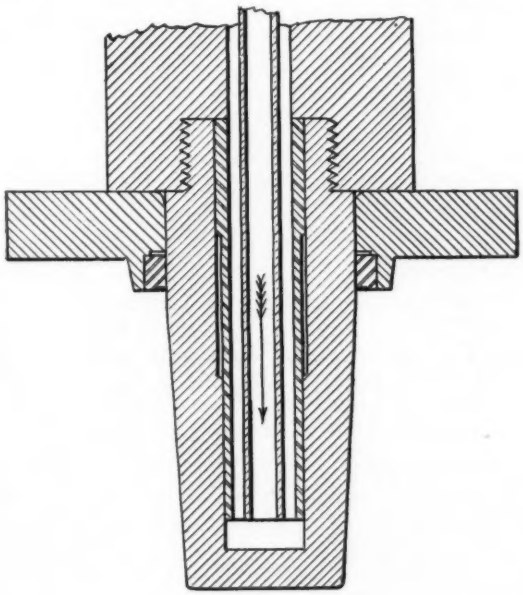


FIG. 7

example of this. The valves drop well below the housing to permit the circulation of the cooling wind about the point of the valve while the lower sleeve acts as a guide and also protects the shoulder from the cooling action of the wind.

When laying out a mold for an article one must first determine what kind of equipment will be used and the mold developed for that particular equipment for it is obvious that a mold ring and plunger balanced for side lever would be out of balance for machine work.

The minimum of equipment for pressing would be one ring, one plunger and one mold. Up to four, or in rare cases five molds are used on side lever presses. Semi-automatic presses use from three to eight molds and the full automatic seldom uses less than six molds and may use as many as sxteen. In each case the set of molds is served by a single plunger and ring. Machines have been built to operate a number of plungers but it is doubtful if one could find a machine of this type working today on straight press ware.

Most of the drawings have been copied from comparatively old drawings and are not recommended as models but merely illustrate principles that have not been published but often have had to be rediscovered by the ever changing

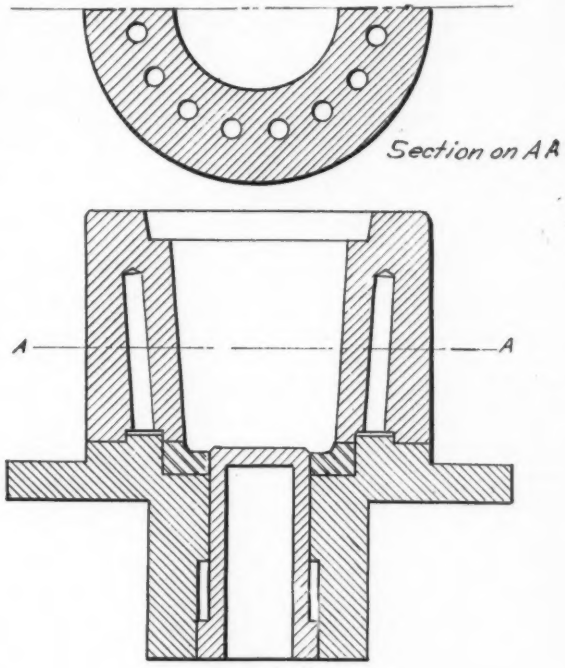


FIG. 8

personnel of our glass factories. Few present day mold shops would guarantee to produce workable molds as complicated as those used in many of the factories of thirty to sixty years ago.

Correction

Just before going to press with the June issue, after proofs had been approved, a proof reader, well-intentioned but inexperienced in glass technology, made some incorrect alterations in Table No. 4 in A. R. Payne's paper, "Density Control of Glass Tanks," on page 123. The table, correctly revised, appears below:

Corrected Table No. 4

	Position in the Tank	Density
1.	From 1 ft. below surface. 4 ft. from r.w.¢.m.e.	2.4480
2.	From bottom, 4 ft. from r.w.¢.m.e.	2.4459
3.	From bottom, 4 ft. from l.w.¢.m.e.	2.4508
4.	From bottom, 3 ft. from bridge, c.m.e.	2.4498
5.	From surface, 4 ft. from l.w.¢.m.e.	2.4497
6.	From 1 ft. below surface, 4 ft. from l.w.¢.m.e.	2.4515
7.	From surface, 3 ft. from bridge, c.m.e.	2.4474
8.	From surface, 4 ft. from r.w.¢.m.e.	2.4497
9.	From 1 ft. below surface, 3 ft. from bridge, c.m.e.	2.4492

r.w.—right wall.
l.w.—left wall.
c.m.e.—on longitudinal center of melting end.
¢.m.e.—on latitudinal center of melting end.

The Laboratory

By J. B. KRAK, Technical Editor

Technology, Uses and Analysis of Selenium

SELENIUM is being used in glass manufacturing on an increasing scale for four purposes, first, as a decolorizer, second to produce pink colored glassware, third for ruby glass, fourth to make lead amber glass.

Selenium was discovered in 1817 by the Swedish chemist Berzelius, in the slime of a chamber process sulphuric acid plant.

Chemically, selenium resembles sulphur and tellurium. Like sulphur it occurs in different allotropic forms. The amorphous, red modification is soluble in carbon disulphide. From this solution it is precipitated in the form of dark red, transparent crystals, having a melting point of 170 degrees C. When red, amorphous selenium is heated to 97 degrees C. it changes to black selenium, with the formation of heat. In this form, selenium has a metallic luster, is insoluble in carbon disulphide and is a conductor of electricity. The electrical conductivity varies considerably, depending on the intensity of the light to which it is exposed.

Selenium occurs in copper bearing minerals, and is a by-product of the electrolytic copper refineries. A part of the selenium is eliminated from the copper ores during the smelting process and is found in the flue dust, from which it can be recovered. Flue dust may contain up to 12 per cent selenium. Another portion of the selenium is found in the anode slimes.

Selenium is prepared from flue dust in several ways, by fractional sublimation or by leaching, followed by chemical reduction. The flue dust is leached with hydrochloric acid, with the aid of a strong oxidizing agent, such as sodium chlorate. The solution is then strengthened in hydrochloric acid, to prevent precipitation of the tellurium during the subsequent gassing with sulphur dioxide, which precipitates red selenium in a fine powder form. This powder is melted and cast into cakes, or it can be dried in an oven, during which process it changes to the black form at 97 degrees C.

Commercial selenium is usually quite pure, analyzing from 99 to 99.5 per cent selenium, the chief impurities being lead sulphate, arsenic, antimony, tellurium, iron oxide and lime.

The production of selenium in the United States for the period of 1921 to 1927 has been increasing steadily.[1] The price has declined from over $5.00 a pound in 1910 to less than $2.00 a pound, quoted at the present time.

YEAR	WEIGHT (Kilograms)	VALUE Dollars
1921.....	25.400	89.000
1922.....	56.200	178.000
1923.....	57.600	237.000
1924.....	69.850	286.000
1925.....	88.000	331.000
1926.....	114.307	438.000

[1] Mineral Resources of the United States, 1926.

Selenium as a Decolorizer for Glass

As a decolorizer selenium is used as the black modification, in the form of sodium selenite (Na_2SeO_3), containing 45.7 per cent selenium or as barium selenite ($BaSeO_3$), containing 29.9 per cent selenium. The red modification is rarely used. Selenium boils at 680 degrees C., and part of it is lost by volatilization during the melting process. For this reason the more expensive, but more stable salts of sodium or barium are preferred by some glassmakers.

The function of selenium is to produce a covering effect by the formation of a slight pink color, complementary to the green tint caused by iron. This element is always present to some extent in the raw materials, and is dissolved from the refractory clay forming the pots or tank blocks. The combination of green and pink give a neutral effect to the eye.

White light is composed of an infinite number of shades, ranging from the deepest violet, through blue, green, yellow, orange and red to the deepest red. It is not necessary to have all of these colors present, in order to produce the effect of "white" light to the eye. When properly selected, a combination of two colors is sufficient, such as red and bluish green, orange and deep blue, yellow and indigo blue, violet and greenish yellow. In a similar way light green and pink produce white light.

Formerly manganese dioxide was used as a decolorizer exclusively. It is still used to a considerable extent, especially in making pot glass. Two causes have been responsible for the increased use of selenium, namely, the more general use of tank furnaces and the war. Manganese does not function well in a reducing atmosphere, such as prevails in tank furnaces. Selenium under these conditions produces the best results. The war greatly increased the price of manganese, due to its consumption by the steel mills, and the decrease of imports. This narrowed the difference in price, stimulated experiments with the result that now manganese has been relegated to second place.

There is, of course, a limit to the amount of iron that can be decolorized by selenium, or any other decolorizer. When reasonably pure raw materials are used, one-half ounce of selenium will be ample to use with 1,000 pounds of sand. Since selenium alone may give a slight yellowish tinge, a small amount of cobalt is used in conjunction, giving a slight blue color, which is complementary to the yellow. From one-sixth to one-eighth of the amount of selenium used is the proper quantity of cobalt to be added. The maximum amount of iron that can be eliminated from the view, and leave a clear and transparent glass is about 0.10 per cent iron oxide.

Pink and Orange Colored Glass

A pink color is obtained in soda lime, or potash soda lime glasses under oxidizing conditions, by the use of nitre.

An orange color is obtained when a mixture of uranium and selenium is used.

Ruby Glass

Selenium ruby can be made in pots and in tanks, using sand, soda ash, zinc oxide, borax, bone ash, cadmium sulphide and selenium. The quantities of selenium and cadmium sulphide used vary considerably, and in view of the high price of selenium, glassmakers would be well repaid by making some experiments to ascertain how much selenium is sufficient to make ruby glass. As little as 0.25 per cent selenium in glass produces a deep ruby color.

Some glassmakers use sulphur and cryolite in their batches. If a clear glass is desired, the function of these materials is not apparent. Certain it is that good ruby glass can be produced with it.

It is desirable to obtain a glass that will be red "from the pot." In many cases the glass shows a straw yellow color, and does not turn red until flashed in the glory hole, or heated in the lehr. When the molds are run hot, the glass will turn red during pressing. It is required that the glass be held at the temperature just above the softening point, for the proper development of the ruby color.

The selenium ruby color is of a nature radically different from colors produced by cobalt, copper, and the like. These elements color glass in direct proportion to the quantities used. The selenium ruby color does not appear until a certain concentration of the selenium and cadmium is present. Then the color appears with considerable intensity. Variations in intensity may be obtained by skilful reheating, in the glory hole or in the lehr. The appearance of the ruby color is undoubtedly due to a readjustment of the particles of coloring material, which can only take place when they have reached sufficient mobility. The glass must have a certain fluidity. When the viscosity is great, and the glass is cooled quickly only a small number of coloring particles have had the opportunity to become effective, and the ruby color will be light. When the fluidity of the glass is greater, and the time factor is increased, the ruby color will become more pronounced. This may explain the fact that glasses containing practically the same amounts of selenium may yet differ widely in color intensity.

Amber Glass

Lead glass may be given an amber color by the use of selenium, under oxidizing conditions. Borax helps to bring out the color, and improves the brilliancy of the glass. Selenium amber plains easily. In this respect it is superior to carbon and sulphur amber glasses, which have a tendency to foam, and are difficult to obtain free from seeds. Since lead amber glass cannot be made with carbon and sulphur, selenium is a convenient material for the production of high grade amber tableware.

Analytical Methods

Reducing agents precipitate selenium as red, elementary selenium from its solution in acids. Sulphur dioxide gas is the most frequently used agency. Hydrazine salts, such as hydrazine sulphate, chloride or hydrate may be used. Hydroxylamine is preferred by some chemists. In the determination of the atomic weight of selenium Lenher[2] used ammonium hexabromselenate from which the selenium was precipitated with hydroxylammonium chloride.

[2] *J. Am. Chem. Soc.* 20, 555 (1898).

PROCEDURE. Weigh 0.5 gram of the sample into a beaker, add a little water, 15 cc. nitric acid and evaporate almost to dryness on a water bath. Allow to cool, neutralize the nitric acid with ammonia and add about 10 cc. of hydrochloric acid. Filter from the insoluble, and add hydrochloric acid until the solution contains at least 70 per cent by volume.

Cool the solution to below 20 degrees C. by holding the beaker in cold water. Gas with sulphur dioxide, with frequent stirring to granulate the precipitate. Allow to settle, decant through a perforated crucible, wash with concentrated hydrochloric acid and finally with cold water. To the precipitate remaining in the beaker add some cold water, followed by boiling hot water and stir until the selenium becomes black and granular. Complete the filtration, wash with hot water and alcohol. Dry to constant weight at 105 degrees C. and weigh. Heat the crucible gently until the selenium is completely burned off and weigh again. The difference in weight is the selenium in the sample.

TELLURIUM. To the filtrate from the selenium add three grams of tartaric acid, dilute to four times its bulk with hot water, add ammonia until the acidity is reduced to a few per cent and gas with sulphur dioxide. Boil the solution, allow to settle in a warm place, filter on a perforated crucible and wash with hot water. Dry at 105 degrees C. and weigh as in the case of selenium.

Lead, copper, iron, aluminum and calcium can be determined by dissolving from 10 to 25 grams of the sample in 50 to 75 cc. of nitric acid in a casserole and evaporation to dryness. The selenium is burned off over an open flame, the residue is dissolved in nitric acid, and the elements named are determined in the usual manner.

Determination of Selenium in Ruby Glass

Treat from three to five grams of the finely powdered glass with hydrofluoric and nitric acids. Remove the hydrofluoric acid by repeated evaporation with nitric acid. Allow to cool, add hydrochloric acid and filter. Add enough strong hydrochloric acid to the filtrate to make its acidity 70 per cent, and gas with sulphur dioxide. Filter and weigh the selenium as described above.

If it is desired to determine cadmium in the filtrate, this can be done (after removal of the sulphur dioxide and most of the hydrochloric acid by boiling) by addition of sulphuric acid, and weighing of cadmium sulphate in a tared platinum dish as $CdSO_4$.

To determine very small amounts of selenium, as are present in glass that is decolorized by this element, the method of Fränkel[3] as modified by Cousen[4] is recommended.

[3] *Sprechsaal*, 47, 444 (1914).
[4] *J. Soc. Glass Technology*, 7, 303, (1923).

German Soda Ash Factories Reorganize

The former Syndicate of German soda ash and caustic soda factories (Ltd.), of Bernburg, controlling soda ash and caustic soda, was liquidated under its title "Deutsches Soda-und Aetznatron Syndikat G.m.b.H.," but was immediately reorganized into two syndicates. One "Syndikat deutscher Sodafabriken G.m.b.H." controls calcined and crystal soda ash and bicarbonate, while the other, "Syndikat deutscher Aetznatronfabriken G.m.b.H." covers caustic soda, solid and liquid.

The Glass Industry

ESTABLISHED 1920

The First Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials, and Glass Factory Equipment and Operation

Published Monthly

Copyrighted, 1928, by

GLASS INDUSTRY PUBLISHING COMPANY, INC.
50 Church Street, New York

Telephones { Cortlandt 2465 / Cortlandt 5618 — Cable Address, Glasdustry

J. B. KRAK, Technical Editor

Subscription Price.....$2.00 a Year
Single Copy.....20 Cents

THE GLASS INDUSTRY circulates extensively among American and foreign glass manufacturers, their business executives and technical and factory operating staffs.

CONTRIBUTIONS

THE EDITOR welcomes practical articles on all subjects related to GLASS MANUFACTURING. Such articles, if accepted, will be paid for at our usual rates.

Vol. 9 JULY, 1928 No. 7

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Standardization

The importance of the standardization movement, now on foot in practically every civilized country of the world, is attested by the simultaneous appearance of the annual reports of two of the leading institutions devoted to this object, United States Bureau of Standards at Washington and the National Physical Laboratory at Teddington, England. At the same time the June issue of the *Journal of the American Ceramic Society* has been published, being given over for the greater part to a collection of standard definitions, specifications, tests and description of apparatus, which is to form a part of the Book of Standards of the American Ceramic Society.

The Standards Yearbook furnishes an impressive picture of the standardization activities, comprising almost every field of human endeavor. No less than fourteen international agencies are listed. Twenty of the world's leading nations now have standardizing institutions.

The value to industry of these agencies of progress is incalculable. The work of the American Ceramic Society on standardization would by itself justify the Society's existence.

The Glass Division Committee on Standards has adopted the tentative methods of analysis of soda lime glass. It is gratifying that a beginning has been made with this important work which should be continued with as much speed as possible. There must be standardized methods of analysis before there can be thorough standard specifications of materials used in the glass industry.

Industry Cooperates with Science

The Mechanical Engineering Department of the University of Pennsylvania has announced the second year of its course in Fuel Engineering, inaugurated a year ago. The course will begin October 1, and will be given by leading national authorities, associated with the principal concerns of the country engaged in the fuel industries, such as the United Gas Improvement Company, the Standard Oil Development Company, the American Gas Association, the Atlantic Refining Co., the Detroit Edison Company, the New York Steam Corporation, the Standard Oil Company of New Jersey and others of equal importance. Graduates will receive the degree of Master of Science in Fuel Engineering.

This modern progressive spirit of the university contrasts favorably with the ultra conservative attitude of our institutions of learnings prevailing only a few years ago. In the past, industry received but scant support from educational institutions. In return, industry looked with suspicion on college graduates, who became of value only after "getting over" much that had been learned at school. The "practical man" and the "learned professor" generally were at odds.

All this has changed. We now see the leading men of industry cooperating with the leading men of science for the preparation of those on whose shoulders will fall the responsibility to carry on in years to come.

The universities and technical schools of the principal glass producing states should consider the possibilities of in-

augurating a similar course for advanced students, who desire to enter the glass industry. Here is an opportunity for service that has been overlooked. One would like to think of a course in glass manufacturing sponsored and actively supported by the leading glass manufacturing concerns of the country.

Ceramics is now being taught at no less than fourteen educational institutions in this country, and two in Canada. England has its school of glass technology at the University of Sheffield. Germany has departments of glass technology at the technical schools of Aachen, Charlottenburg, Hanover and Karlsruhe, besides having a glass training school at Zwiesel, Bavaria. But at present, the great class producing states, Pennsylvania and West Virginia, offer but little to the student of glass engineering and glass technology.

Let us hope that the plans to open a department of glass technology at the University of Pittsburgh, the center of the American glass industry, will soon be realized.

Glass Distributors in Trade Practice Conference

At a trade conference held on June 14th at Chicago by the Federal Trade Commission at the request of the National Glass Distributors Association, which is said to include about 85 per cent of the distributing field of the glass industry, questions of price discrimination, breach of contract, fraud, misrepresentation, secret rebates, and other unfair trade practices were discussed. The meeting was presided over by Commissioner A. F. Myers, and M. Markham Flannery, director of Trade Practice Conferences, represented the Commission. Resolutions were adopted as below, it being understood that where the word "industry" occurs, it includes manufacturers and distributors of window glass, plate glass and rolled glass, as well as manufacturers and distributors of products kindred to the use and distribution of glass.

The Resolutions

INDUCING BREACH OF CONTRACT

1. The wilful interference by any person, firm, corporation, or association, by any means or device whatsoever, with any existing contract or order between a seller and a purchaser, in or about the production, manufacture, transportation, purchase, or sale of any product handled by the industry or the performance of any contractual duty or service connected therewith, such interference being for the purpose or with the effect of dissipating, destroying, or appropriating, in whole or in part, the patronage, property or business of another engaged in such industry, is an unfair trade practice.

MISBRANDING

2. The marking or branding of products of the industry for the purpose or with the effect of misleading or deceiving purchasers with respect to the quantity, quality, grade or substance of the goods purchased, is an unfair trade practice.

FRAUD AND MISREPRESENTATION

3. The sale or offering for sale of any product of the industry with intent to deceive customers or prospective customers as to the quantity, quality, substance, or size of such product, is an unfair trade practice.

UNBRANDED PRODUCTS

4. The sale or shipment of window or sheet or other flat glass not branded or marked to indicate its true character, in accordance with accepted standards of the industry, is an unfair trade practice.

SUBSTITUTION OF QUALITY

5. As the shipment by manufacturers of window glass without labels on each light showing the quality of such glass makes possible the easy substitution of a lower quality of glass for a higher quality, particularly when such glass is removed for shipment or use from the original factory container, the industry hereby records its approval of the labelling by manufacturers in accordance with accepted standards of the industry, of each light of window glass showing its thickness and quality, as a means of preventing unfair competition and deception of the purchasing public.

SECRET REBATES

6. The payment or allowance of secret rebates, refunds, credits, or unearned discounts, whether in the form of money or otherwise, or the giving of premiums, or extending to certain purchasers special service or privileges not extended to all purchasers under like terms and conditions, is an unfair trade practice.

INDUCING SALES OF OTHER PRODUCTS

7. The Industry hereby condemns as an unfair trade practice, the selling of glass without profit for the purpose, directly or indirectly, or with the effect, of furthering the sale of some other product.

PRICE DISCRIMINATION

8. Any discrimination in price between purchasers of the same class, not including discrimination in price on account of the difference in grade, quality, or quantity of the product sold, or which makes only due allowance for difference in cost of selling and transportation, or discrimination in price in the same or different communities not made in good faith to meet competition, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly, is an unfair trade practice; *provided*, however, that nothing in this resolution shall be construed to prevent the publication and use of a special quantity price applicable to a definite quantity of goods which are placed in one order and, at the option of the shipper, are moved as one shipment.

PRICE DISCRIMINATION

9. As the failure of the industry to adopt uniform practices with respect to requiring purchasers to pay transportation and trucking charges has inevitably resulted in unfair price discrimination, the allowance of transportation or trucking charges, on products (a) sold F.O.B. seller's warehouse or city, or (b) sold on a delivered basis, transportation charges to be paid by the consignee, in *excess* of the actual or published amount of such charges, is an unfair trade practice; *provided*, however, that nothing herein shall be construed to prevent the payment by the seller at his option of trucking charges within city limits.

10. As packing, freight, and trucking charges are necessarily reflected in price and as the variable practice on the part of sellers of requiring purchasers in some instances to pay such charges and in other instances of assuming such charges, causes unfair price discrimination, the failure of the seller to require the purchaser in each instance to pay published charges for packing, freight, and trucking is an unfair trade practice.

FREE TRUCKING

11. As freight or transportation charges are reflected in the price, free trucking beyond city limits is an unfair method of competition, unless published with the price and allowed to all customers buying similar quantities within the same territory.

ARBITRATION

12. The Industry hereby records its approval of the practice of handling disputes in a fair and reasonable manner coupled with a spirit of moderation and good will, and every effort should be made by the disputants themselves to arrive at an agreement. If unable to do so, arbitration under some one of the prevailing codes should be agreed upon, as it is at all times preferable to litigation, with its costly handicaps and delays.

SELLING WITHOUT SPECIFICATIONS

13. The acceptance by distributors and manufacturers of blanket contracts from dealers or distributors of their product without statement of specifications affords opportunity for the rejection of such contracts by the purchasers on decline of price, provides an artificial stimulus to the Industry through the existence of large numbers of unconfirmed contracts with resulting enhancement of prices to consumers, and constitutes an unfair trade practice; *provided*, however, that nothing herein shall be construed to prevent the acceptance of contracts under the terms of which complete specifications will be furnished within ten days from date of acceptance of order, except in case of bona fide building contracts, then quantity and approximate sizes to be filed within ten days.

POOLED OR COMBINATION CARS

14. The expense of manufacturing, selling and transportation being appreciably more costly for small-quantity than for large-quantity lots, the Industry hereby records its opposition to the sale of products to separate purchasers as full carload or other

group lots, at a sales price which does not take into consideration the added expense involved in such method of sale.

ANTI-DUMPING

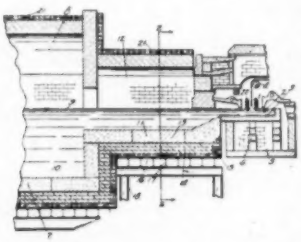
15. The practice of certain manufacturers and sellers of shipping quantities of merchandise into territories outside their particular territories and of selling such merchandise below the general market prevailing in such other territories into which shipments are made seriously tends to demoralize the market within the territory into which shipments are made, disrupts normal competitive conditions throughout the entire industry and is condemned as an unfair practice.

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

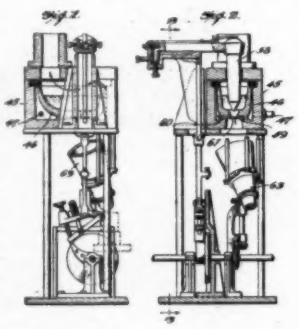
Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

CONTINUOUS TANK FURNACE. U. S. 1,670,098. May 15, 1928. William K. Brownlee, Toledo, O., assignor to Libbey-Owens Sheet Glass Co. Filed 3/29/24. The inner wall of the tank is constructed of relatively small fire-clay blocks, which can be burnt very hard and offer the maximum resistance to the chemical action of the molten glass. This tank wall is surrounded by a plurality of rows of fire brick which may be laid very closely together, with broken joints so as to provide extremely narrow and tortuous passages for the molten glass which seeps through between the tank blocks. The intermediate wall of fire brick has no great insulating value but acts as a baffle wall to stop the outflow of molten glass. The outer insulating wall is formed of bricks having high insulating properties, but no great strength, and will be reinforced by an outer metallic plate resting on suitable supports.

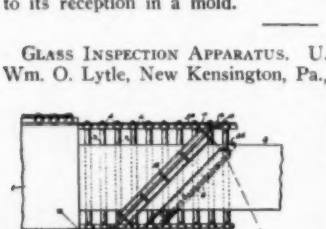


With this construction the inner wall of the tank blocks can be formed of the most effective and economical size of blocks, and can be operated under the most effective temperature conditions.

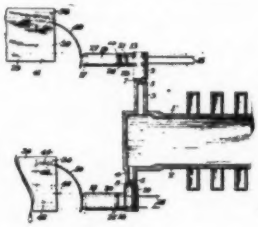
GLASS-FEEDING MECHANISM. U. S. 1,663,925. Mar. 27, 1928. T. C. Steimer, Pittsburgh, Pa., assignor to Hartford-Empire Co. Filed 2/12/10. A method of and apparatus for feeding glass through a downwardly discharging outlet from a parent body, the glass issuing from the outlet into a heated zone in which the glass as it issues from the outlet is accumulated prior to its delivery to the forming mechanism. This results in a heat treatment of the glass after its issuance through the orifice and prior to its reception in a mold.



GLASS INSPECTION APPARATUS. U. S. 1,671,772. May 29, 1928. Wm. O. Lytle, New Kensington, Pa., assignor to Pittsburgh Plate Glass Co. Filed 5/20/25. Extending transversely and beneath the runway in an oblique direction, is a light chamber preferably made of sheet metal with one vertical end wall acting as a support for a large number of incandescent lights, and with the opposing vertical wall of frosted glass, which serves to diffuse the light from the lights. Extending along the light chamber in opposition to the frosted plate is an inclined polarizing reflector. This reflector is supported in a suitable framework and preferably consists of a slab of black glass. The light received upon this mirror from below is reflected substantially horizontally, and an analysis of these light rays serves to indicate the condition of strain throughout the width of the sheet. It is placed at such an angle that the light from the light box is polarized, the polarized rays being reflected vertically upward. The vertically reflected polarized rays pass through the glass sheet, and are received upon a second reflector which also extends across the bed of the runway, so that its longitudinal edges are parallel to the edges of the reflector. The colors as observed through the analyzer at different points across the width of the sheet indicate the condition of the glass with respect to strain and any variation in these conditions is readily observed through the analyzer.



SHEET GLASS PRODUCTION. U. S. 1,671,073. May 22, 1928. Paul F. Gutmann, St. Louis, Mo., assignor to Mississippi Glass Co. Filed 5/21/25. In the pouring of molten glass from the melting furnace onto a forming table or between forming rolls for the manufacture of sheet glass to secure best results it is necessary to use some means for spreading the glass out as it comes from the furnace to substantially the width of the sheets to be formed therefrom. By feeding the molten glass from the furnace into a horizontal cylinder or drawn through an end thereof and supplying it therefrom to the forming machinery through a horizontal opening or slit in the side thereof of a length about equal to the width of the sheet glass to be formed. For making wire glass formed with the apparatus of my present invention I merely insert suitable wire-setting apparatus in its proper relation thereto.



PLURALITY-SHEET DRAWING APPARATUS. U. S. 1,670,247. May 15, 1928. Enoch T. Ferngren, Toledo, O., assignor to Libbey-Owens Sheet Glass Co. Filed 2/20/25. A tank furnace, a tank communicating therewith and having a mass of molten glass therein, and means for drawing a plurality of sheets therefrom, each of said sheets being drawn from a different stratum of glass.

BOTTLE MANUFACTURE. U. S. 1,668,427. May 1, 1928. J. H. Sephton, Hamilton, Ontario, Canada, assignor to Dominion Glass Co. Filed 5/12/27. The object is to increase the speed at which a bottle making machine may be operated by providing a bottle supporting and conveying apparatus adapted to receive delivery of the bottles from the bottle making machine and in which provision is made for supporting the weight of the bottle from the neck or finish at the top of the bottle so that the bottles may be delivered from the bottle making machine in a more or less semi-plastic state or at least in a not fully solidified or hardened state. A further object is to provide a conveyor which will transport the bottles from the bottle making machine to the lehr.

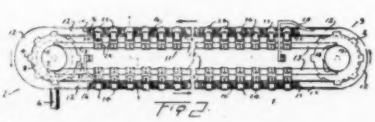


FIG 2.

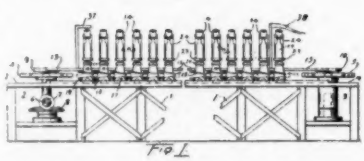
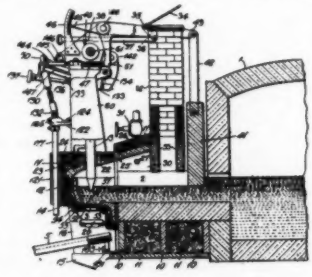
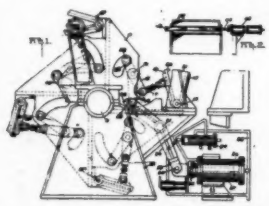


FIG 1.

METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,655,391. Jan. 3, 1928. Karl E. Peiler, West Hartford, Conn., assignor, by mesne assignments, to Hartford-Empire Co., Hartford, Conn. Filed 5/5/19. Comprises a method and apparatus whereby mold charges may be preformed while segregating them from a supply of molten glass in a furnace or container, and before bringing their external surfaces into contact with relatively cold molds or other supporting or forming means, and whereby the form and size of such charges may be controlled and varied at will, and without destroying their uniform consistency by the unequal chilling action of external or relatively cold molds or other supports or forming means.

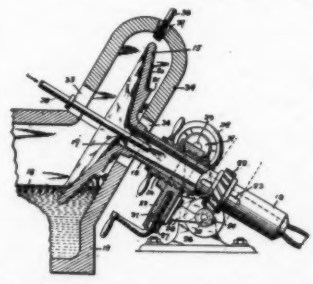


PRESSING GLASS. U. S. 1,673,108. June 12, 1928. Robert L. Ellery, Toledo, O. Filed 1/20/26. The object is to provide a method of and apparatus for pressing glass between two approaching surfaces in such a manner as to spread the glass evenly and form clear sheets which will require the minimum of grinding and polishing. In apparatus for pressing glass, a series of molds each comprising two mold plates, means for placing each mold in succession with its molding space substantially vertical, a cylinder and piston, means operable by said piston for pressing the mold plates together while in receiving position, means to move the mold in succession from receiving position to a discharging position with its mold cavity substantially horizontal, cam means for separating the plates of each mold as the mold approaches discharging position, another cylinder and piston, and means operable by the last said piston for ejecting a molded article horizontally from each mold in succession at the discharging position.



METHOD OF AND APPARATUS FOR MELTING GLASS. U. S. 1,669,676. May 15, 1928. Edward J. Schneider, Toledo, O., assignor to Libbey Glass Manufacturing Co. Filed 2/7/23. Maintaining pool of molten glass, removing glass from one portion of the pool for shaping operations, maintaining the supply in the pool by introducing, into another portion of the pool, refined molten glass cooler than the glass in the pool, applying heat to the surface of the pool and thereby maintaining its temperature, and maintaining the pool of such size that the cooler glass, by which the supply is maintained, heats up and gradually mixes with glass previously in the pool before it reaches the portion of the pool from which glass is removed.

METHOD AND APPARATUS FOR USE IN THE MANUFACTURE OF GLASSWARE. U. S. 1,670,058. May 15, 1928. Leon Jean Broche, St. Cloud, France, assignor to Tropenas Co., New York. A feeder for molten glass comprising a rotary pick-up member arranged on an axis inclined to the surface of the bath of molten glass and dipping at its lower periphery into the latter, said pick-up member being apertured toward its axis and delivering glass from its upper inclined surface through said aperture in the form of an annulus, in combination with a tubular axial extension of said rotary pick-up member through which said annular discharge from the pickup member passes in the form of a fluid cylinder, together with means at the discharge end of said tubular extension for establishing an intermittent feed of the glass to associated apparatus.



GLASS FURNACE AND LEHR. U. S. 1,669,968. May 15, 1928. J. H. O. Bunge, London, Eng., assignor to Hartford Empire Co. Filed 5/11/25. This invention contemplates the provision of a glass furnace having a melting portion and a refining portion separated by a bridge wall, one or more fluid-fuel burners arranged to project flame into the refining portion of the furnace, passages in the bridge wall through which the air for combustion is conducted for preheating before being supplied to the burners, a feeder arranged to receive glass from the furnace and to deliver the glass to a suitable glassware forming machine, a lehr for annealing the glassware produced by the forming machine, and channels for conducting hot gases from the furnace to the feeder and to the heating passages of the lehr. The lehr may be provided with a stack for inducing the circulation of the hot gases from the burner through the furnace and through the lehr.

Important Decision on Bulb Patents

After years of litigation in the courts, Charles Eisler of Newark, N. J., won a verdict on May 12 in the United States Court of Appeals against the General Electric Company, who sued Mr. Eisler personally and his company for infringing on one of their patents covering a machine for inserting wires in the glass buttons of electric light bulbs.

Judges Woolley, Buffington and Davis ruled that the machine made by Charles Eisler does not infringe. An abstract from the Judges' opinion reads, "Eisler has gone back to the old hand art and instead of discarding that art as the General Electric did, has utilized it and has simply transformed the method and means

CHARLES F. EISLER

of that hand art and embodied that hand method in two separate, non-cooperating automatic machines."

In the first and second suits the General Electric Company contended that the Eisler process was an infringement on its own patented method for tipless tube and lamp manufacture, and that the machine used infringed on their own make. This legal battle was carried on for three years, the final decision protecting the Eisler patents on the tipless situation.

On the claim of infringement based on the use of a cold blast jet after the wire is inserted, the court concurred with the lower court, saying: "The claims 3, 4 and 5 relate to a cooling blast feature, after the wire is inserted. I fail to see anything new in this. There certainly cannot be patentable novelty in cooling glass after it has been heated and the wire fused. This makes it unnecessary to consider the patents cited in anticipation of this feature."

The case has attracted much attention. Mr. Eisler is president and treasurer of the Eisler Engineering Company, 762 South 13th St., Newark, N. J. He is an engineer and scientist, and a successful executive and salesman. His mechanical inventions for the manufacture of radio tubes and electric lamps are well known.

The full text of the opinion of the court was published in the *United States Daily* (Washington, D. C.), on May 26, 1928.

This case concerns the insertion by machinery of wires in the glass buttons of electric light bulbs to form a spider or frame to support the filament.

The mode of operation of the General Electric machine consisted

in heating the entire button circumference and driving the wires simultaneously into the softened circumference, whereas defendant's machine was designed for spot heating of the button and successive insertions of successive wires.

Originally the General Electric Company, as assignee of John T. Fagan, sought to improve upon by a machine shown in an application made by Fagan on June 12, 1908, which resulted in the grant on February 9, 1915, of Patent No. 1128120 for a "Machine for manipulating glass rods and forming spiders therewith."

The significant departure and contemplated improvement by Fagan in the way of output quantity was in concentrating the making of a spider into a single, mechanical operation which consisted in heating the entire desired button circumference and driving the wires simultaneously into such softened circumference. In other words, he gave up spot heating of the button and successive driving in of the wires.

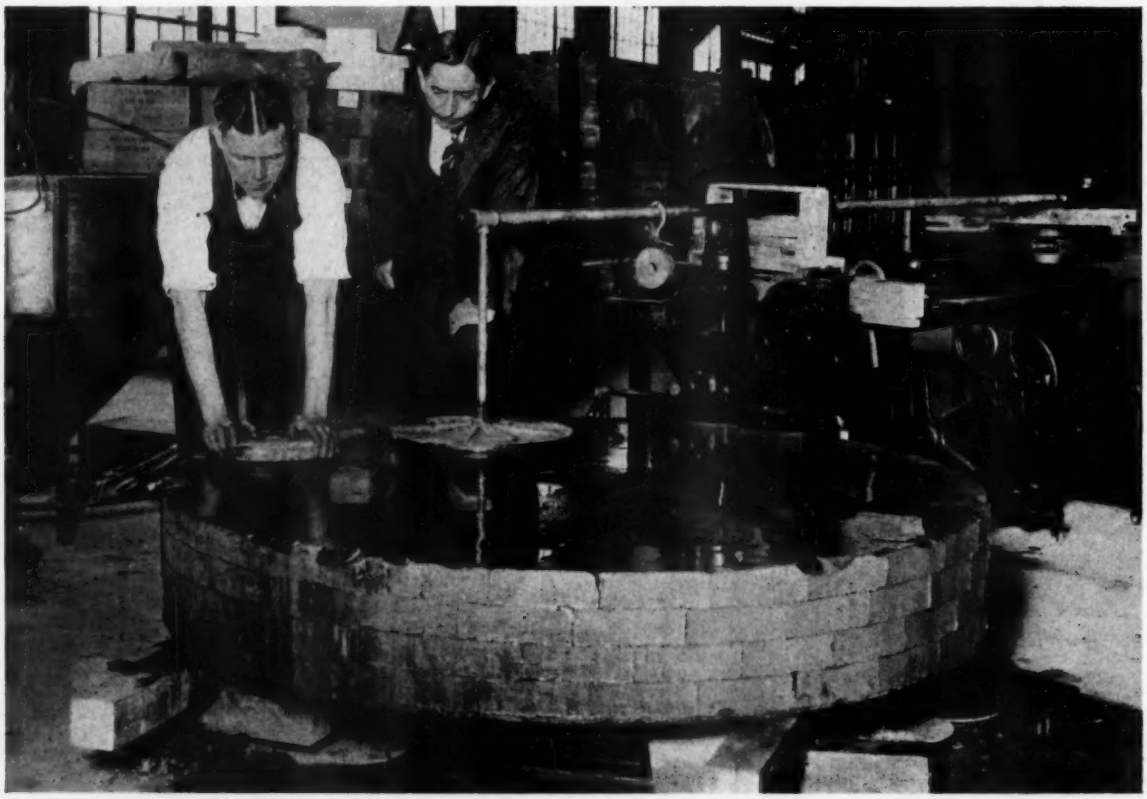
Whatever may have been the cause, Fagan's machine, so far as the proofs in this case disclose, never made any impress on the art, or indeed was put into practical use. In view of the fact of the large use of electric bulbs and the great quantities of such articles required in business of his assignee, the General Electric Company, and its large resources which enabled it to utilize Fagan's machine, it is significant that it was not put into use.

So regarding it, the Judges were of the opinion the defendant's machine does not infringe. It has gone back to the old hand art and instead of discarding that art as Fagan did, has utilized it and has simply transformed the method and means of that hand art and embodied that hand method in two separate, non-cooperating machines.

In one of such machines it forms the button just as the old hand method formed the button initially. Then it swings the cooled button around to a point where a separate mechanism utilizes the old successive hand method of spot heating a single place on the button and inserting by machinery instead of by hand a single wire at that spot heated part of the button. This done, the machine then spot heats another point of the button and then and there inserts another wire just as the hand worker did. And this operation of spot heating and successive wire insertion is carried on until the spider is finished. In other words, the defendants' machine simply does by machinery what the old art did by hand, and it does what Fagan got his patent for discarding, namely, spot heating of the button and successive insertions of successive wires.

On November 22, 1909, George W. Beadle applied for, and on December 10, 1912, was granted Patent No. 1046724 for a machine for manufacturing supports for incandescent lamp filaments.

It is apparent, says the recent decision, that when Fagan, in conjunction with Frech, on October 1, 1913, applied for their Patent No. 1220836 for a filament-support-wire-inserting machine which utilized the hand process, the disclosure in Beadle's patent of a mechanical adaptation of the hand process gave Fagan and Frech a secondary and minor place in the art of adapting the hand process to machine operation.



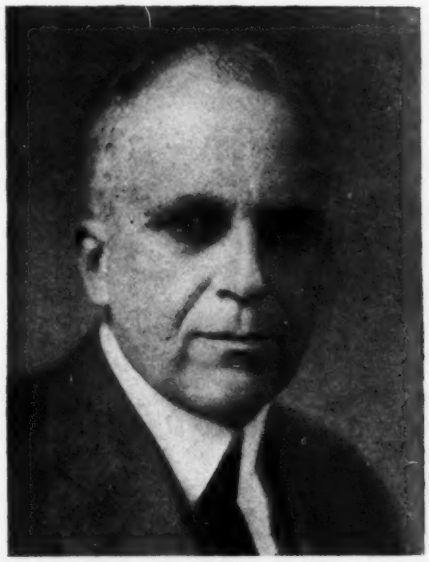
Grinding of Greatest Reflecting Mirror Under Way at Bureau of Standards

A. N. Finn (standing) inspecting the work of grinding and polishing the world's largest reflecting mirror, the casting of which by the Bureau was described and illustrated in the March, 1928, issue of THE GLASS INDUSTRY. On the left of the picture, A. H. Lindner is doing the grinding.

This huge 70-inch telescope reflector, which was begun in 1927, will be placed in the reflecting telescope at Perkins Observatory of the Ohio Wesleyan University when completed. The mirror is so large that no firm would undertake the work of finishing and polishing it, so officials at the bureau decided to do the work themselves. The disc, was tested for internal strain and appeared to be so well annealed that the finishing operations were started without any apprehension. Eleven inches thick and weighing about 3,500 pounds, the disc was uncovered January 21, 1928, after being "baked" for eight months under graduated temperatures in a specially constructed furance at the Bureau of Standards. Four unsuccessful attempts had been made to obtain a disc of this size, and the method finally developed was devised by Mr. Finn of the Glass Section of the Bureau of Standards.

New Glass Container Association Officials

Charles R. Stevenson, one of the early pioneers on the industrial management field, and at the present time one of the most successful among leaders in this profession, was unanimously elected to the post of business manager of the Glass Container Association, left vacant by the resignation of I. G. Jennings, announced in the June number, who had conducted the affairs of the Association for more than nine years. This official action of the Board of Directors was announced on May 1, 1926. At the same time an announcement was made that Frederick J. Rummel, former statistical director of the Association, had been chosen as assistant business manager.



C. R. STEVENSON

F. J. RUMMEL

Mr. Stevenson brings to the Association a broad background of experience, which can hardly be rivaled among outstanding figures in the complicated texture of modern affairs. He is by no means a stranger to the glass industry, having been vitally interested in its progress and development for many years and having been actively associated with many corporations and industrial organizations in this and in allied lines.

After graduating from Harvard University in 1902, Mr. Stevenson spent a year at the Homestead Works of the Carnegie Steel Company, then went with the United States Steel Casting Company of Everett, Mass., as assistant superintendent.

It was a vision of the ever-increasing necessity for scientific control and the conviction that industrial success lay in capable plant management and in the fearless analysis of the problems of such management that caused him to cast his lot with the newly organized firm of Miller & Franklin who were pioneering in the field of industrial engineering.

Nine years later Mr. Stevenson became general manager of the E. R. Thomas Motor Car Company during a reorganization period; then general manager of the Veneer Products Company of Mishawauka, Ind. About this time he served as president of the Western division of the Associated Advertising Clubs. In 1916, he got back into his professional field, forming his own organization, still known as the Stevenson Corporation, which specializes in standard costs, wage incentive methods, internal organization problems, and marketing and distribution.

He has also been active for many years in the councils of the National Association of Cost Accountants and is now president of that association.

In addition to his management of the Glass Container Association, Mr. Stevenson is the executive head of the Bureau of Envelope Manufacturers of America, the Illuminating Glassware Guild, the Jute-Twine Manufacturers Association, the Foundry Supply Manufacturers Association, the Metal Compartment Manufacturers Association, the Upholstery Leather Tanners Association, and the Porcelain Enamel Manufacturers Association.

He was recently elected secretary of, and assumed responsibility for directing the activities of the Window Glass Manufacturers Association. He likewise handles all of the uniform cost work for the following associations: Folding Box Manufacturers National Association, Label Manufacturers National Association, National Association of Employing Lithographers, Steel Barrel Manufacturers Association, National Coffee Roasters Association, The Spice Grinders Section of the American Spice Trade Association, the International Association of Electrotypers of America, Millers' National Federation, Printing Ink Cost Bureau, and many others.

In addition to his association work, Mr. Stevenson's organization is retained as cost consultants for various individuals and corporations including prominent industrial corporations.

Mr. Stevenson will be ably assisted in his conduct of the affairs of the Glass Container Association by Frederick J. Rummel, whose promotion to assistant business manager also took effect on May 1. Mr. Rummel graduated from the Wharton School of Finance, University of Pennsylvania, in 1916. He also served as a captain in the 40th Infantry, United States Army, from early in 1917 to May, 1919. Following his army experience, Mr. Rummel became one of the most successful cost experts on the roster of Stevenson, Harrison & Jordan, with whom he was connected up until June, 1923, when he accepted a position with the Liberty Glass Company of Sapulpa, Okla. On September 1, 1925, he came East to become statistical director of the Glass Container Association.

National Window Glass Workers Dissolved

The National Window Glass Workers executive board held a meeting at the Association's headquarters in Columbus, O., on June 2. At the last meeting of the executive board a resolution had been passed to the effect that unless substantial progress had been made in organizing the workmen in the machine branch of the industry before June 1, 1928, the Association would dissolve. President John M. Siemer reported at the June 2 meeting that little progress had been made. Later in the day action was taken providing that all of the assets be converted into cash and, after all liabilities were met, the balance in the treasury would be distributed pro rata to the members holding membership cards for the fiscal year ending June 30, 1928. The organization on June 1 had cash assets totaling approximately $2,900 and receipts from the sale of material and equipment of $430.

The decline of the organization from a prosperous condition early in the century has been due largely to the development of mechanical methods of glassmaking.

Glass Factory Equipment and Supplies

Most of the information printed in this department comes direct from the manufacturers of the products described.

New Feldspar Mill at Trenton

The new feldspar grinding mill of Golding Sons Company and Erwin Feldspar Company, at Trenton, N. J., which was put in operation in June, is clearly illustrated in the accompanying views. Numerous novel features are embodied in its design and construction.

Fig. 1 shows the side of the plant on which the raw material enters. In Fig. 2 are shown the storage bins for finished material, from which trucks or railroad cars are directly loaded for shipment.

Each of the storage bins for crude material has a capacity of 300 tons, and provision has been made for adding two more bins.

A brief account of the plant and process follows, as described by V. V. Kelsey of the Golding and Erwin organizations.

At the extreme left of the raw material bins is located a large jaw primary crusher that reduces the feldspar down to approximately two-inch pieces. From the crusher the material is elevated in a bucket elevator to the top of the raw storage bins and is discharged onto a horizontal belt conveyor that is provided with a tripper which can be located to discharge the crushed rock into any one of the bins.

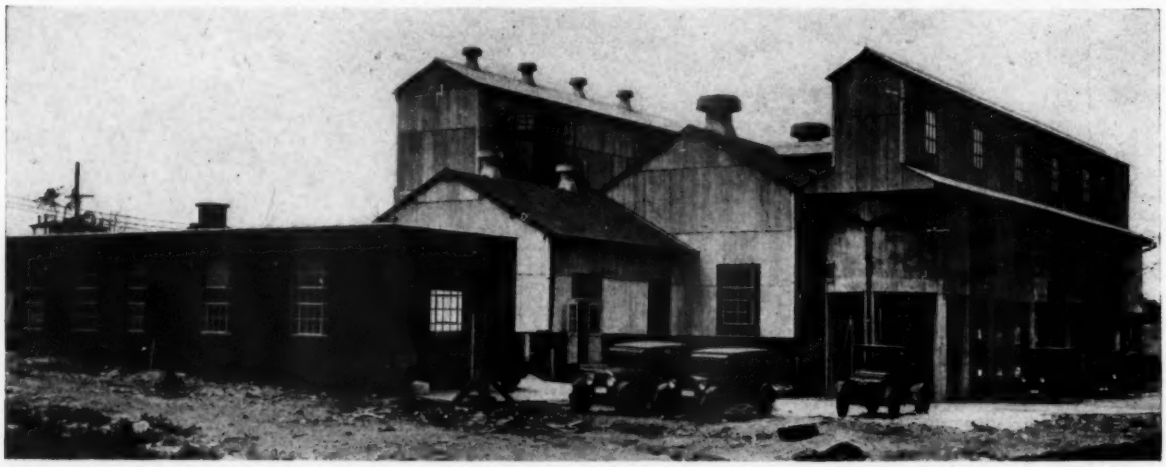


FIG. 1—NEW TRENTON MILL OF GOLDING SONS COMPANY

Underneath the storage bins there are located two traveling Schaffer poidometers. These poidometers can be operated singly or in tandem. Inasmuch as they are movable, it means that one can be located under No. 1 bin and the other under No. 2, 3 or 4—or both under the same bin. If, for instance, it is desired to grind Maine spar, which is stored in No. 1 bin, the poidometer is set so as to deliver a predetermined amount of spar uniformly onto a belt conveyor that discharges into a secondary crusher. If for any reason it should become desirable to ship a blended spar—say 60 per cent Maine spar and 40 per cent North Carolina spar, one poidometer would be set under the bin containing Maine spar, regulated to deliver a uniform amount in the proportion of 60 per cent Maine spar, and the second poidometer would be placed underneath the bin containing North Carolina spar, regulated to deliver a uniform quantity amounting to 40 per cent of a blend of Maine and North Carolina spar.

FIG. 2—AT LEFT, STORAGE BINS FOR FINISHED MATERIAL

The poidometers are electrically operated and are provided with electrical cut-outs, so that if either one or the other should fail to function they both stop immediately, thus precluding absolutely any error in blending.

From the secondary crusher which reduces the spar to ½-inch size and smaller, the material is elevated to a dryer and after the crushed material leaves the dryer it is elevated to a vertical gravity dryer. From the dryer, the material is passed over a Dings magnetic separator to insure the removal of any iron and then discharged into a large wooden feed bin. After the material leaves the dryer it does not again come in contact with iron.

From the wooden feed bin the material is passed through the latest type of Hardinge "air swept" mill, which has a capacity of two tons per hour when grinding the material to 200 mesh. After the material is ground in the mill it is passed to an intermediate storage bin where the material is sampled and held until after the tests are completed. It then passes to the large circular finished storage bin. All through the process, every provision has been made to insure uniformly prepared material.

Additional grinding units are being installed to permit the grinding of Cornwall stone and flint.

Golding Sons Company's new mill at Spruce Pine, N. C., has also been completed, having a capacity of approximately one hundred tons a day. This is designed a little differently from the one at Trenton and has the following flow sheet:

> From crude storage bins to crushers, to Hardinge mills, over magnetic separators, then over screens (fines going to car direct or to air separators, tailings returned to Hardinge mills; tailings from air separators also being returned to Hardinge mills), then from the air separators to cars or storage bins.

The mill was located at Spruce Pine in order to be closer to the sources of raw materials at that particular point. The company's other mills at Erwin, Tenn. and East Liverpool, O., are of course still being operated.

The Glass World and What It Is Doing

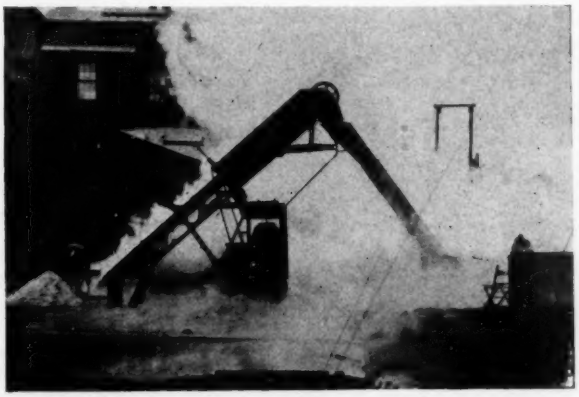
News of the Industry

Coal Loader and Conveyor Handles Glass

Removing 300 tons of molten glass from a furnace is quite a problem; one which has been solved, however, in a practical manner by the Thatcher Manufacturing Company, who used a Barber-Greene coal loader and belt conveyor for removing this awkward material from their furnaces.

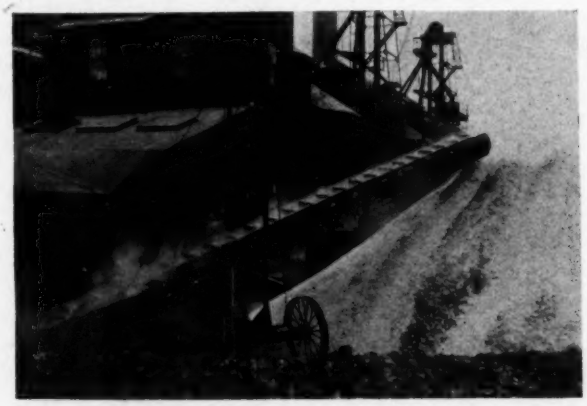
In times past, the method has been to allow the furnace to cool off and then break out the glass with crowbars and sledges after it solidifies. Recently, compressed air drills have been used to some extent on this work.

Some time ago, however, the Thatcher management found



COAL LOADER HANDLING HOT GLASS

that by draining this glass out while it is still in the molten condition and allowing it to run into a rapidly moving stream of water, the glass would be quenched and carried out so that when delivered to storage piles it would be in granular form and



BARBER-GREENE CONVEYOR PILING FINISHED CULLET

in shape to use again without crushing. This process involved the use of several men and took quite a long time. In fact, it had taken from two to three days to drain a furnace using this method.

In the early part of April, it was found necessary to drain furnace No. 1, and E. J. Pittman, superintendent of the Thatcher factory at Streator, Ill., conceived the idea of using their Barber-Greene coal loader and 42-foot belt conveyor in place of men and wheelbarrows. This method was found to be very satisfactory. Not only did they eliminate a good part of the labor, but cut the time down to 27 hours. This was possible because they could run out a larger stream of glass than could be handled by men with wheelbarrows.

As the molten material comes from the furnace it goes down a trough and is emptied onto the lower end of the coal loader. At this point the glass comes in contact with the fast moving stream of water which immediately breaks it up into small bits. The flights on the coal loader drag the hot abrasive material up the high carbon steel trough to the discharge end. Here the glass slides down a chute to the lower end of the Barber-Greene conveyor. The belt immediately conveys the material to the top of the storage pile.

This new and novel application is undoubtedly one of the most unusual to which coal handling machines have ever been adapted.

Tariff Commission Studying Cost of Potash

Field work has been ordered in the investigation of the cost of the production of potash, by the U. S. Tariff Commission. Frank Talbot and W. J. Didicott will conduct a cost survey in New York City.

Further discoveries of subtsantial bodies of potash salts in Texas have been announced by the Department of the Interior. Prices of imported potash now are stated to be moderate, but the foreign monopoly has been re-established and continues to be a potential threat against the security of American agriculture and American national defense. The most promising sources of potash brought to light by Federal investigations are the potash salts associated with extensive Permian salt deposits of Texas and New Mexico. Each of the holes thus far drilled has encountered some potash salts but in three of them substantial bodies of potash, rich enough to have commercial promise, have been discovered.

May Construction Largest on Record

The highest month ever recorded for construction contracts placed in the 37 States east of the Rocky Mountains is the May report of F. W. Dodge Corporation. New building and engineering work contracted for in these states (about 91 per cent of the total country) during the past month amounted to $668,097,200. This tops the previous high record of April, 1928, by about 25 million dollars. The increase over May of last year was 21 per cent.

The combined total for new construction started during the first five months of this year is also a record breaking figure. The total for the first five months of 1926 held the record up until now. This year's figure, amounting to $2,796,301,300 is 9 per cent ahead of the total for the first five months of last year and is 7 per cent over the total for the corresponding period of 1926.

New York State and Northern New Jersey had the largest May record ever reported.

Four Dollar Import Duty on Glass Sand

Several glass factories on the East and West coasts will be affected by a decision announced by the Bureau of Customs on June 16 that effective 30 days after that date, so-called Belgian sand used in glass and for fluxing purposes must be classified as dutiable at $4.00 per ton, thus distinguishing it from sand employed in building and other constructional operations.

The decision resulted from an investigation made by the Bureau at the instigation of domestic producers and covers glass sand containing silica in excess of 99 per cent, being dutiable as silica, crude, under paragraph 207.

Plate Glass Production Increasing Over 1927

From figures compiled by P. A. Hughes of the Plate Glass Manufacturers Association, the production of polished plate glass for the month of May, 1928, was 10,223,683 square feet, as compared with 9,953,474 square feet produced in the previous month, April, 1928 and 9,618,273 square feet produced in the corresponding month last year, May, 1927.

The total production for the first five months of 1928 was 49,772,512 square feet as compared with 49,832,382 square feet produced in the first five months of 1927.

Canadian Tariff Hearings on Sodium Sulphate

Bishopric & Lent Company, Cincinnati, O., owners of a natural deposit of sodium sulphate located at Expanse in the Province of Saskatchewan, has entered an application for an upward revision of the Canadian tariff on sodium sulphate. In their petition the company states that it has expended in plant and development work approximately $500,000, that employment is furnished to 100 with a weekly payroll of $2,000, and that production capacity of the plant is 50 tons daily.

Changes in French Barytes Production Plans

The firm Produits Barytiques, manufacturers of barytes, operating a plant at Merzig, France, has recently made arrangements with the Kuhlmann Company for the control of their entire output of barytes and the plant has been moved from Merzig to the Kuhlmann plant at Dieuze. The Produits Barytiques in the future will devote their energies exclusively to the production of lithopone.

Will Continue Fuel Engineering Course

Professor Robert H. Fernald, director of the Mechanical Enginering Department of the University of Pennsylvania, recently announced that the graduate course in Fuel Engineering has been sufficiently successful to warrant its continuation for the year 1928-1929.

New Source of Barium and Zinc Fluorides

Charles Hardy, Inc., 100 East 42nd Street, New York, have been appointed distributing agents for the United States for barium and zinc fluorides now being manufactured by The Aluminum Company of America. Increased interest in these materials is being shown in the glass, enamel, tile, and brick trades.

Washington Tariff Investigation Off Till Fall

Late in May it was stated by Secretary John F. Bethune of the Tariff Commission, that results of the commission's field investigations into costs of plate and window glass were being tabulated, but that no action by the commission could be expected before next fall.

Trade Activities

The Glenshaw Glass Company, Glenshaw, Pa., recently lost their glass tank and are busy rebuilding it.

The Paul Wissmach Glass Company's plant, Paden City, W. Va., will be closed down until September.

The American Window Glass Company's plant at Arnold, Pa., was recently shut down for cold repairs.

The Pennsylvania Bottle Company, who recently started operations at their plant at Sheffield, Pa., are rebuilding their Wilcox (Pa.) plant.

The D. O. Cunningham Glass Company's plant at Pittsburgh, Pa., is running both of their tanks, one on flint and the other on light green, and report a good volume of orders.

W. L. Ciause, chairman of the board of directors of the Pittsburgh Plate Glass Company, was recently elected president of the trustees of Grove City (Pa.) College.

The Toledo Engineering Company, Toledo, O., recently made important changes in its organization. G. W. Batchell was made president and F. G. Schwalbe, secretary.

The French American Glass Company, Inc., have moved their office and showroom from 130 Bleecker St., New York, to 175 Fifth Avenue. At their previous address, 130 Bleecker Street, a stock of their products is being maintained.

The Atlantic Bottle Company, Brackenbridge, Pa., are reported as enjoying a wonderful run in a tank originally built by the Russell Engineering Company and more recently remodeled by the H. L. Dixon Company.

The Owens Bottle Company, at Huntington, W. Va., recently put into operation a furnace that had been idle for eighteen months, bringing their production up to approximately 80 per cent of the plant's capacity.

James A. Beha, Superintendent of Insurance, New York State, as a result of representations made by insurance interests, consented to change his original order for a 25 per cent reduction in rates for plate glass insurance to 16 2/3 per cent and the new rule became effective on May 1.

The Rainbow Novelty Glass Company, Clarksburg, W. Va., capital $50,000, has been organized to manufacture glass novelties. C. J. Applequist of Swissvale has been elected president, K. G. Davis, Clarksburg, secretary and treasurer. S. Frum, formerly of the Hazel-Atlas Glass Company will be in charge of the plant.

Clear-View Glass Company on June 6 applied for a Pennsylvania charter, the object of the proposed corporation being the manufacture, buying, selling and dealing in glass and other materials of a similar nature. Jackson & Troutman, Butler, Pa., represented the company in making the application.

The Scohy Sheet Glass Company, Sistersville, W. Va., on June 14 resumed production operations, making an excellent grade of glass. They have orders on file for many weeks ahead and expect to exceed all previous records. The company is under the management of J. P. Scohy and his son, N. R. Scohy.

F. W. Salisbury of the American Plate Glass Corporation, on June 11, assumed the position of superintendent of the Durant City, Pa., plant, succeeding F. L. McElwain, who has resigned on account of ill health but who is remaining wtih the company until about the first of July.

The Roessler & Hasslacher Chemical Company announce that Philipp Moll, formerly sales manager of C. H. Boehringer Sohn, Hamburg, and Nieder-Ingelheim on Rhine, and more recently vice president and sales manager of Dissosway Chemical Company, has joined their staff as assistant to the manager of sales.

Fred Dennis of Pittsburgh, Pa., has become associated with J. B. Greer, 1627 Princess Avenue, Pittsburgh, Pa., manufacturers of automatic glass machinery, and will aid in introducing certain automatic glass cutting machines which have been developed by Mr. Greer and which they believe will practically revolutionize the manufacture of cut glass tumblers and table ware.

J. Frank Rogers, former engineer and manager of the gas producer and furnace division of the Wellman-Seaver Morgan Company, Cleveland, O., has opened consulting offices at Room 314, Euclid-Sixty-First Building, Cleveland, O., specializing in combustion and fuel engineering, particularly that pertaining to either raw or clean producer gas.

The Celite Products Company, Los Angeles, Cal., has issued bulletin No. 141 on "The Insulation of Breechings and Stacks." A specification is given covering the lining of stacks and breechings on the inside of steel with Sil-O-Cel standard brick and another for the outside cover of the breechings and ducts where inside lining is not feasible.

The Miller Machine & Mold Works, Columbus, O., are building an addition to their plant at 705-719 Ann Street. The new structure, 100 x 40 feet, at the rear of the present factory will be used as an assembly room. It has been almost completed and is being equipped with a two-ton electric traveling crane extending across the entire shop. Other new equipment recently added includes a new index boring machine. The company reports that they are doing twice as much business as a year ago, largely on their new machine recently put on the market for pressed and blown ware.

The Mathieson Alkali Works, Inc., 250 Park Avenue, New York, recently announced the appointment of E. E. Routh as manager of sales, following the resignation of John W. Boyer, who had occupied that position for the past six years. Mr. Routh has been a member of the Mathieson organization for thirty years, with the exception of four years in college, having started in as office boy at the Saltville plant at the age of eleven. For the past eight years he has held the important post of Southern sales manager, with headquarters at Charlotte, N. C. Effective at once, he will now be transferred to the executive offices of the company in New York City. The Company also announces the appointment of Fred O. Tilson, who has been representing the Company in the Southwest, as Southern District sales manager, with offices at Charlotte.

Coming Meetings

The Glass Container Association has announced that the next members' meeting will be held at Montreal, Que., sometime during September, the date and the name of hotel to be announced later.

The American Society of Mechanical Engineers will hold its annual election by letter ballot, closing on September 25, 1928. Elmer A. Sperry of the Sperry Gyroscope Company, Brooklyn, N. Y., has been nominated for the presidency.

The American Society of Mechanical Engineers will hold its summer meeting at St. Paul and Minneapolis, Minn., August 27 to 30. Two hundred members from the East are planning a lake trip to Duluth on the boat which leaves Buffalo August 20.

The National Fuel Meeting under the auspices of the Fuels Division of the American Society of Mechanical Engineers will be held in Cleveland, September 17-20, 1928. An interesting and instructive technical program covering the use of solid, liquid and gaseous fuels in all fields, has been prepared.

The American Association of Flint and Lime Glass Manufacturers will hold its annual meeting in Atlantic City on July 16, at the Marlborough-Blenheim Hotel. The National Association of Manufacturers of Pressed and Blown Ware will meet at the same hotel on July 17 to discuss wage conditions with the executive committee of the American Flint Glass Workers Union. During the later part of the month, the wage conferences will be continued by the various departments of the trade.

Recent Deaths

P. H. C. Kieser

P. H. C. Kieser, secretary-treasurer of the Mitchell Clay Manufacturing Company, St. Louis, and connected with that company for many years, died at his home in that city on May 27, at the age of 48 years.

Joseph E. Flanagan

Joseph E. Flanagan of Chicago, widely known in the glass industry and particularly the stained glass branch, and organizer of the Stained Glass Association, died suddenly on Decoration Day, May 30.

Inquiries Received

For further information address THE GLASS INDUSTRY

418. Can you give us the names of the firms making glass wool? (May 1.)

419. Where may we obtain some lettered glass and glasscine labels, such as used on lettered shelf ware? (June 14.)

420. Please give us a list of suppliers of broken white glassware. (June 19.)

What The World Wants

Specific Inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

Mexico: 31674, glass and earthenware.
Germany: 31806, glass beads.

Glass Stock Quotations

PITTSBURGH STOCK EXCHANGE, JUNE 22, 1928
Reported by Moore, Leonard & Lynch, Union Trust Bldg., Pittsburgh, Pa.

	Bid	Asked	Last
American Window Glass Machine, Com...	..	19	19½
American Window Glass Machine, Pfd...	..	38	38
American Window Glass, Pfd.....	86	90½	88½
United States Glass.....	13	13⅞	14
Pittsburgh Plate Glass, Com.....	230	..	230⅛
Standard Plate Glass, Com.....	..	..	4¼
Standard Plate Glass:			
Preferred cumulative	..	..	19⅛
Prior preferred	..	34	31

TOLEDO, O., JUNE 26, 1928

	Bid	Asked	Last
Owens Bottle, Pfd.....	115	..	115
Libbey-Owens Sheet Glass, Com.....	119	125	119
Libby-Owens Sheet Glass Pfd.....	115	..	117

WHEELING STOCK EXCHANGE, JUNE 26, 1928

	Bid	Asked	Last
Hazel-Atlas	87½	88	88½
Imperial	..	..	72
Fostoria	210	..	208
Central	..	..	75
Jefferson, Pfd.....	..	..	96

READERS WANTS AND OFFERS

GLASS MAKER WANTED

A SUCCESSFUL window glass manufacturing company requires the services of a PRACTICAL AND COMPETENT glass maker for a modern factory equipped with sheet machines. Must know combustion and how to melt under all conditions with both natural and producer gas, and have a thorough knowledge of the composition of glass batch and the effects of different ingredients under all conditions peculiar to glass furnaces. A man under 45 preferred. Steady position with future advancement for right man. Don't reply unless your previous experience is such as to fully equip you to handle the job. State age, nationality, qualifications and where employed for the past seven years. Address SW-1, c/o Glass Industry Publishing Co., 50 Church St., New York.

For Sale: CULLET of all Descriptions
Free from Caps, Wires, etc.
GEORGE F. BAUMANN, Dealer,
1110 Carroll Street, Brooklyn, New York.
Carloads Ready for Immediate Shipment.

WANTED, BACK NUMBER of THE GLASS INDUSTRY, January, 1923. Premium offered. Address, 50 Church St., New York.

GLASS ENGINEER

Particularly qualified for development work. Seven years' training in ceramic and chemical engineering. Five years' experience in development work in GLASS. Five years' experience as Chief Engineer in charge plant construction, manufacturing, and general engineering in metallurgical and mechanical lines. Thoroughly experienced in patent matters—registered patent attorney.

Address: Glass Engineer, c/o THE GLASS INDUSTRY, 50 Church Street, New York.

Current Prices of Glass-Making Materials

June 21, 1928

Quotations furnished by various producers, manufacturers and dealers

		Carlots	Less Carlots
Acid			
Citric (dom.)	lb.	.46	.46
Hydrochloric (HCl) 20° tanks, per 100 lb.		..	1.10
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.50	..
Tartaric	lb.	.38	.38
Alcohol, denatured	gal.	..	.53
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3)	lb	..	.07
Ammonium bifluoride (NH_4) FHF	lb.	..	.21
Ammonia water (NH_4OH) 26° drums	lb.	.03	.03¼
Antimony, metallic (Sb)	lb.	..	.10⅞-.11
Antimony oxide (Sb_2O_3)	lb.	..	.13
Antimony sulphide (Sb_2S_3)	lb.	..	.13
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.04	.04¼-.04½
Barium carbonate ($BaCO_3$)			
Precipitated	ton	57.50	60.00
Natural, powdered, imported	ton	45.00	50.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	..
Barium nitrate ($Ba(NO_3)_2$)	lb.	.08¼	.08½
Barium selenite ($BaSeO_3$)	lb.	..	..
Bone ash	lb.	.05	.05½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.02½-.03½	.02¾-.03¾
Boric acid (H_3BO_3)	lb.	.07-.07¼	.07¼-.07¾
Refined	lb.	.07-.07¼	.07¼-.08
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.10-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	.27	.28
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.25-.30
Black prepared	lb.	..	.30
Cryolite ($Na_3Al F_6$) Natural Greenland Kryolith)	lb.	.09	.10-.10½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.15-1.30
Feldspar—			
100 mesh	ton	13.00-20.00	15.50-22.00
80 mesh	ton	11.75	14.50
40 mesh	ton	11.00	13.50
Fluorspar (CaF_2) domestic, ground, 95-98% (max SiO_2 2½%)			
Bulk, carloads, f.o.b. mines	ton	32.50	..
In bags or barrels	ton	36.50	41.50
Formaldehyde	lb.	.08	.08½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.03¼-.07
Black (FeO)	lb.	.03½	..
Kaolin (f.o.b. mine)	ton	9.00	..
English, lump, f.o.b. New York	ton	14.50	24.50
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb.	..	..
Lead oxide (Pb_3O_4) (red lead)	lb.	.08¾-.09¾	.09¾-.10
Litharge (PbO)	lb.	.078-.08¾	.08¾-.09
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	11.50-12.50	..
Burnt (CaO) ground, in bulk	ton	8.00	..
Burnt, ground, in paper sacks	ton	10.00-11.00	..
Burnt, ground, in 280 lb. bbls..Per bbl.		2.15	2.30
Limestone ($CaCO_3$)		2.00	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.06	.07
light (in bbls.)	lb.	..	.23
extra light (in bbls.)	lb.	..	.37
Magnesium carbonate ($MgCO_3$)	lb.	.06	.08
Manganese 85% (MnO_2)	lb.	.04	.04½
Nickel oxide (Ni_2O_3), black— for nickel content	lb.	..	.35
Nickel monoxide (NiO), green— for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	..	23.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.08½	.09
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	06¾	.07½
Hydrated 80-85%	lb.	.06	.06½
Potassium chromate (K_2CrO_4)	lb.	..	.26
Potassium hydrate (KOH) (caustic potash)	lb.	.07⅞	.08
Potassium nitrate (KNO_3) (gran.)	lb.	..	.05⅝-.06
Potassium permanganate ($KMnO_4$)	lb.	.14½	.15
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.23
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	19.00-20.00	..
Selenium (Se)	lb.	..	1.95-2.00
Silver nitrate (AgNO.)	(100 oz.) per oz.	..	.41
Soda ash (Na_2CO_3) dense, 58%—			
Bulk, on contract	Flat per 100 lb.	1.22½	
In barrels	Per 100 lb.	1.55-1.57½	2.40
In bags	Per 100 lb.	1.37½-1.40	..
Spot orders..02½-.05 per 100 lbs. higher			
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.07	.07¼
Sodium hydrate (NaOH) (caustic soda)	Per 100 lb.	3.35	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03⅞	.04½
95 per cent.	Per 100 lb.	2.20	2.50
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.04½	.05
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.50
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy in bbls.	Per 100 lb.	3.35	3.20-3.40
Tin chloride ($SnCl_2$) (crystals)	lb.	.38½	..
Tin oxide (SnO_2) in bbls.	lb.	..	.56
Uranium oxide (UO_3) (black, 96% U_3O_8) 100 lb. lots	lb.	..	1.50-2.25
Zinc oxide (ZnO)	lb.	.06½-.08½	.12
Zircon			
Granular (Milled .005-.02c higher)		.07	.07½-.08
Crude, Gran. (Milled .005-.02c higher)		.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS Corrected to May 24, 1928		April 1927 Quantity	April 1927 Value	April 1928 Quantity	April 1928 Value	Four Months Ending April 1927 Quantity	Four Months Ending April 1927 Value	Four Months Ending April 1928 Quantity	Four Months Ending April 1928 Value
Glass and glass products (total)		.....	$766,421	.....	$830,911	.....	$2,892,200	.....	$3,108,609
Plate and window glass—									
Window glass, common, box 50 sq. ft.		3,071	15,795	811	$3,331	6,942	40,855	5,050	$30,828
Plate glass, unsilvered, sq. ft.		80,673	36,245	221,994	68,527	437,887	129,586	655,977	232,375
Other window and plate glass	lbs.	305,497	33,531	211,091	22,736	1,319,460	117,179	1,068,377	135,799
Glass containers (bottles, vials and jars)		.....	266,367	.....	292,471	.....	942,499	.....	1,043,475
Table glassware, plain		.....	139,786	.....	110,780	.....	514,015	.....	431,419
Table and other glassware, cut or engraved		.....	13,753	.....	7,602	.....	43,795	.....	37,206
Lamp chimneys and lantern globes	lbs.	187,062	34,362	192,364	37,490	734,587	149,799	680,087	137,406
Globes and shades for lighting fixtures	lbs.	127,009	51,157	154,913	60,715	536,779	206,919	544,661	203,967
Chemical glassware	lbs.	17,010	17,566	24,043	20,680	54,163	52,853	72,841	62,894
Electrical glassware, except for lighting	lbs.	129,623	14,117	681,892	56,548	784,117	79,180	1,913,147	148,835
Other glassware		.....	143,742	.....	150,029	.....	615,520	.....	644,405
IMPORTS **Corrected to May 24, 1928**									
Glass and glass products		.....	$1,337,826	.....	$1,155,385	.....	$5,502,227	.....	$4 381,018
Cylinder, crown and sheet—									
Unpolished—									
Weighing less than 80 pounds per case	dut. lb.	5 432,397	129,672	3,707,320	109,844	17,512,674	452 843	12,653,355	366,107
Weighing 80 pounds or over per case	dut. lb.	3.042,779	128,895	3,301,788	137,955	13,808,636	645,955	11,554,527	503,980
Bent, ground, beveled, colored, painted, etc., and polished	dut.	.....	26,177	.....	46,434	.....	138,504	.....	152,649
Plate glass—									
Polished, unsilvered	dut. sq. ft.	1,486,940	404,667	1,447,580	338,808	5,615,076	1,779,814	5,067,325	1,122,085
Other	dut. sq. ft.	71,534	30,756	74.257	16,771	336,595	98,936	353,519	83,262
Bottles, vials, jars, demijohns and carboys, molded or pressed	dut.	.....	15,139	.....	9,679	.....	70.613	.....	68,238
Table and kitchen utensils	dut.	.....	4,399	.....	24,305	.....	37,141	.....	84,837
Glassware, cut or decorated	dut.	.....	285,368	.....	181,842	.....	1,080,909	.....	768,247
Blown glassware, n. e. s.—									
Bottles, ornaments, gauge glasses and other n. e. s.	dut.	.....	66.205	.....	52.248	.....	242,341	.....	249,729
Bulbs for electric lamps	dut. No.	1,390,654	9,259	1,209,549	12,178	5,578,765	50,026	4,550,705	47,477
Chimneys, globes, shades, prisms and other illuminating glassware	dut.	.....	73,564	.....	81,126	.....	286,957	.....	295,641
Articles and utensils for chemical, scientific, and experimental purposes	dut.	.....	46,894	.....	45,126	.....	166,935	.....	173,341
Other glassware	dut.	.....	116,831	.....	99,069	.....	451,253	.....	465,425